A SYSTEM OF ANATOMICAL PLATES;

ACCOMPANIED WITH DESCRIPTIONS,

AND

PHYSIOLOGICAL, PATHOLOGICAL, AND SURGICAL

OBSERVATIONS.

BY

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PART VII.—THE BRAIN,
FIRST PORTION.

COLOURED AFTER NATURE.

EDINBURGH:
PRINTED FOR DANIEL LIZARS, 61, PRINCES STREET, EDINBURGH;
S. HIGHLEY, 174, FLEET STREET, LONDON; AND
W. CURRY, JUN. & CO. 9, UPPER SACKVILLE STREET, DUBLIN.
1825.

EDINBURGH:
Printed by John Brewster,
11 Society.

TO

ROBERT WILLIAM HAY, ESQUIRE,

M. A. F. R. S. F. A. S.

AND COMMISSIONER FOR VICTUALLING HIS MAJESTY'S NAVY,

AS A TRIBUTE OF GRATITUDE,

FOR HIS DISINTERESTED FRIENDSHIP,

THIS PART IS RESPECTFULLY INSCRIBED,

BY HIS VERY OBEDIENT SERVANT,

THE AUTHOR.

PREFACE.

THE Author has to plead the necessity there existed of colouring the Plates, as an apology for the delay which has occurred in presenting this Part to the Public. The Brain is an organ of such a nature, that it cannot be properly understood unless so delineated; and hence the most distinguished authors upon the subject, as Vicq D'Azyr and C. Bell, have published their works on the Brain in colours. The Author trusts, therefore, that the labour and time required to accomplish this object, will be considered sufficient apology.

In the views represented in the Plates, the Author has followed the common method adopted in the schools, although he confesses, that the mode of development pursued by Varolius, Vieussens, and Gall and Spurzheim, is more connected and natural,

as has lately been confirmed by the assiduous labours of Tiedemann. When the Author, therefore, has finished the description of the insulated portions, he will trace the nervous system in this natural order; but neither in the description of the insulated portions, nor in that of the naturally connected arrangement, will he particularize the various and multifarious points described by Vicq D'Azyr, Malacarne, Reil, and other celebrated anatomists, as he considers many of these bordering on frivolity. This the recent important researches of Tiedemann confirm, researches which, in the Author's humble opinion, tend to throw more light on the anatomy of this mysterious organ, than all the labours of his predecessors, however much the works of these great men are entitled to our respect and admiration. In the present description, the Author has been careful to particularize the discoveries of Tiedemann; and he will again advert to them, when he describes the Brain in its natural order.

In the course of the anatomical description, the Author had made several pathological and surgical observations; but he found these so intimately connected with the whole, that he has deemed it preferable to defer printing them, until the phy-

siological, pathological, and surgical observations are given in connexion. For example, when treating of compressed brain, he found this subject to embrace hydrocephalus and apoplexy; so that had he persevered, the whole of the pathological and surgical observations would have been given before the physiological.

CONTENTS.

THE BRAIN.

THE nervous system is divided into the cerebrum letters A, the cerebellum letters B, and the spinal cord C, with the nerves issuing from these different portions, as represented in Plate I. The encephalic nerves, twelve in number, are not seen in this view, but are delineated in Plates VII. X. and XI. The spinal nerves consist of thirty pairs, but they are not numerically marked in this diagram, as that appeared unnecessary; they are subdivided, like the vertebræ, into 7 cervical, 12 dorsal, 5 lumbar, and 5 sacral pairs.

The cerebrum,* letters A, is that portion of the brain contained within the bones of the cranium, above or coronal to the tentorium, which is the extension of the dura mater between the cerebrum A, and the cerebellum B. The tentorium is partially seen in Plates VIII. and XI., marked *d*.

* Syn. The great brain: The brain proper: Le cerveau.

and in Part I. Plate IV., *Figs.* 3 and 4, along the mesial ridge of the frontal bone, and the junction of the parietal bones, where they form the sagittal suture, and the superior perpendicular ridge *q* of the occipital bone in Part I., Plate IV., *Figs.* 3 and 4. At this extremity it is much broader, and unites with the tentorium *d*.

The falx is formed in the same way as the tentorium, by the lateral portions of the dura mater uniting beneath or centrad to the mesial line of the os frontis, the sagittal suture, and the superior perpendicular ridge of the occipital bone; but leaving a triangular space for the superior longitudinal sinus, which is covered superiorly or coronad or peripherad by the outer lamina of the dura mater, so that the trephine may be applied over it without injury, if the operator proceeds with caution.

Besides these conspicuous productions of the dura mater, there are subordinate ones. A small prolongation extends from the inferior transverse ridge of the occipital bone, between the hemispheres of the cerebellum, as represented in Plate XI., marked ∂, which is named falx cerebelli,* and is formed by the two surfaces of the dura mater, which line the cerebellic depressions of the occipital bone, uniting at the inferior perpendicular ridge of this bone. As there are generally no veins or sinuses here, the manner of its formation illustrates still more satisfactorily that of the falx cerebri and the tentorium cerebelli. Other still smaller prolongations extend along the transverse spinous processes of the sphenoid bone, which are marked B in Plate XI. The sella turcica of the sphenoid bone is observed to be surrounded by the dura mater in Plate XI., and marked C. This ex-

* Syn. Falx minor: Faux du cervelet.

tends from the anterior to the posterior clinoid processes, leaving loose lateral folds, and forming an acute circular edge, which surrounds the infundibulum *o*, in Plate XI. A small portion of the pituitary gland is observed uncovered within this circle. The dura mater also invests the floor of the sella turcica, and separates on each side to form the cavernous sinuses, as represented in one of the Plates descriptive of the organs of sense. This surface, which forms the cavernous sinuses, and invests the sella turcica, is cellular. The dura mater passes out of the various foramina in the basis of the cranium, either to unite with the periosteum of the bones externally, or to form the envelope of the nerves. At the foramen magnum of the occipital bone, it descends lining the spinal canal, as represented in Plate I., marked d.

The dura mater is observable in the fetus of seven weeks.

The membrane observed gliding over the surface of the convolutions of the cerebrum and cerebellum, and still more distinctly on the basis, is named tunica arachnoides.* This envelope is of a bluish milky colour, and so semi-transparent, that it cannot be represented easily on paper. If Plates I. II. III. X. and XII. were covered with mucilage of gum arabic, this would give, as far as possible, an idea of it.

After surrounding the surface of each hemisphere of the cerebrum, adhering to the pia mater on the convexity of the convolutions, the arachnoid membrane envelopes the veins marked with the digits 1 in Plate III., and becomes attached to the cerebral surface of the dura mater D, so as to form its cerebral lining, which is its serous surface. The arachnoid membrane also descends on each

* Meninx media: Membrana cellulosa: La lame externe de la méningine.

side between the falx cerebri ʋ, in Plate IV., and the mesial convolutions of the hemispheres, which it invests downwards to the corpus callosum *w*, where the two unite to form a continuous membrane; which afterwards may be traced posteriorly along the corpus callosum *w*, in Plate V., descending between it and the corpora quadrigemina, marked with the letters e, *e*, where investing the lower surface of the velum interpositum Halleri, marked i, *i*, in Plate VIII., it enters the third ventricle at the foramen commune posterius *a* to spread all over the cavities. Thus, after lining the parietes of the third ventricle 3 in *Fig.* 3 of Plate VII., it descends backwards along the iter a tertio ad quartum ventriculum* represented in Plate XIV., by a dotted line from 3 to 4, and forwards to the infundibulum *o* in *Fig.* 4 of Plate VII: it also ascends by the foramen commune anterius a in Plate VIII., to invest the fifth, marked 5 in *Fig.* 1 of Plate VII. and in Plate XIV., and onwards by the foramen Monroianum, marked M in Plate VI., to the lateral ventricles.

To return to the surface of the hemispheres,—we find the arachnoid membrane expanded over the convolutions, extending across the fissure of Sylvius, and descending between the cerebrum A and cerebellum B in Plate I. to invest the latter, then continuing its course to the basis of the brain, as observed in Plate X., running onwards to encircle the spinal cord C, as in Plate I., down to its termination, where it is reflected on the theca vertebralis d in Plate I. to form a *cul de sac*. In this course, it accompanies the spinal nerves for a short distance, and is then reflected to join that portion of itself which invests the dura

* In the fetus it descends between the columns of the spinal cord to the cauda equina.

mater, here termed theca vertebralis or spinal sheath, marked d in Plate I. In this canal it sends off between the anterior and posterior origins of the spinal nerves, simple duplicatures which extend from the pia mater to the dura mater, being attached to the latter by acute points intermediate to the emergence of the various spinal nerves, from the first to the cauda equina, where the tunica arachnoides becomes again plain and continuous. These denticulata, the whole being named ligamentum denticulatum or dentatum, presently resemble the angular folds, which accompany or envelope the spinal nerves. They adhere to the pia mater by delicate cellular membrane. They are represented in Plate XV. of a bluish colour, extending from the spinal cord c, to the dura mater d, between the different spinal nerves.

To return to that portion of the arachnoid membrane which adheres to the dura mater,—we find it continuous downwards to the margin of the falx ɒ in Plate IV., and all over the dura mater D, tentorium *d*, falx cerebelli δ, and theca vertebralis d in Plates I. and XI., forming its serous surface, and uniting with that which invests the brain and spinal cord, so as to form a perfect sac. Excepting by very minute injections, or when attacked with inflammation, no blood-vessels can be traced upon it. The tunica arachnoides begins to be observable between the fifth and sixth month of the fetus.

The pia mater* is that delicate tissue of blood-vessels, supported by soft cellular membranaceous substance, enveloping the whole surface of the cerebrum A, a, *a*, ā, cerebellum B, spinal cord c, and nerves, as represented

* Syn. Pia meninx: Meninx tenuis: Meninx interior: Membrana vasculosa: La lame interne de la méningine; the soft membrane.

in Plates I. and II. This delicate membrane may be traced adhering to all the convolutions of the cerebrum and cerebellum, descending between their sulci or grooves; and also between the different lobes. On raising the posterior lobes of the cerebrum from the tentorium, we observe the broad vascular expanse of the velum of Haller or the choroid web, as in Plate VIII., marked i, *i*, and in *Fig.* 2 of Plate VII., advancing forwards superficially to the pineal gland H, the corpora quadrigemina e, *e*, and the thalami F, and running beneath the fornix K, on emerging from which in the lateral ventricles, it forms the choroid plexus* *i*, *i*, in *Fig.* 1 and 2 of Plate VII. and in Plate VI. From these plexuses, vessels shoot into the ventricles on the thalami F and the corpora striata G; the greater number of which are veins. This web or the choroid plexuses extend on each side around, backwards, downwards, and again forwards, or iniad, basilad, and glabellad, into the inferior cornua of the lateral ventricles, as seen in Plates VI. and VII. The arteries which supply this web are branches of the posterior artery of the cerebrum, marked *r* in Plate X. The veins concentrate to form the central vessel, marked i in *Fig.* 2 of Plates VII. and VIII., named after Galen. The pia mater formed by the minute distribution of the branches of the internal carotid and vertebral arteries, can be raised from the surface of the convolutions; and in doing so, a multiplicity of small vessels are dragged out of the substance of the brain.

The pia mater, after enveloping the cerebrum and cerebellum, descends on the tuber annulare E in Plate X.,

* Syn. Les plexus choroïdes superieurs. The choroid plexuses are subject to encysted serous tumours resembling hydatids, and to small tubercles, like glands.

where it begins to become thicker, and continues to encircle the spinal cord c in Plate I., being considerably stronger than where it invests the cerebrum and cerebellum: it continues to descend to the cauda equina, investing the nerves in its course, and is lost on them, like their envelope of the dura mater.

The pia mater is formed in the fetus so early as the sixth week.

There are various methods adopted in dissecting the brain; but that which is generally ascribed to Vesalius, being the one most frequently followed, I have preferred, although the method described by Varolius and Vieussens is the more connected. When the different parts have been simply demonstrated, I shall describe this organ in a connected order; for the brain ought to be examined in a variety of ways.

On the mesial aspect of the surface of each hemisphere, close to the longitudinal sinus, and in the sinus itself, are observed small glandular-looking bodies about the size of a pin's head, named glandulæ Pacchioni. These are most numerous towards the posterior or inial aspect of the mesial surface of the hemisphere. A few of them are represented within the sinus, which is marked *x* in Plate III.

On separating the hemispheres A, A, Plates I. and XII., of the cerebrum, at the fissure in which the falx cerebri,* Plate IV. descends, we arrive at an oblong white surface, consisting of an arrangement of transverse medullary fibres, termed corpus callosum,* marked with the letters *w*, forming the floor of this fissure.

* Syn. σωμα τυλλωδης: Fornix vera: Corpus laeve: Commissura magna vel maxima cerebri: Middle or central band: Mèsolobe.

This unites the medullary matter E of the one hemisphere with that of the other, as represented in Plate V. In the fetus, this commissure begins anteriorly to the anterior crura k, k, of the fornix, as seen in Plate VII., *Figs.* 2 and 3, and in Plates VIII. IX., and gradually proceeds backwards with the growth of the hemispheres. This is still better illustrated in Plate XIV., where the connexion of the medullary matter is represented. The corpus callosum is not completed till the sixth month. In Plates IV. and VI. the fibrous or streaked appearance is more correctly delineated than in Plate V., as the weight of the hemispheres from which this latter drawing was taken, had in some degree injured the corpus callosum. In the latter or Plate V. the corpus callosum is observed to be somewhat broader posteriorly or iniad, than anteriorly or glabellad. In Plate VI. there are observed three delicate lines running longitudinally along the corpus callosum, the central one of which is named raphe.* Where these lines extend, the corpus callosum is a little elevated. The two lateral lines appear to be formed by the arteries of the corpus callosum, marked *v*, *v*. When we trace the corpus callosum backwards or iniad, we find it joining or uniting with the expanse of the fornix K, as represented in Plate XIV.

In Plate IV., a section of the right hemisphere has been made parallel to the corpus callosum *w*, which brings into view the two substances which compose the general cerebral mass; the white or orange-white matter E is named medullary,* and appears to be the efficient constituent of this wonderful mass; the greyish, cineritious, or

* Syn. White nervous matter.

reddish, or greyish-brown, or wood-brown matter, which every where surrounds this white mass, is termed cortical.* On examining the surface of the hemispheres A, A, of the cerebrum in Plates I. II. III. and IV., we remark a multiplicity of elevations and furrows, named the convolutions, which are better understood in the sections of Plates IV. V. and VI. These are very late in being developed in the fetus; not until the seventh month.

On removing the falx cerebri ɒ, and the opposite hemisphere parallel with the corpus callosum *w*, we bring into view the centrum ovale of Vieussens, marked E, E, in Plate V. Another oval centre is represented by Vicq D'Azyr, by making a transverse or horizontal section a little above or coronal to this, named centrum ovale latéral ou petit centre ovale. Vicq D'Azyr thus makes an oval centre out of each hemisphere, while Vieussens makes only one. These are simply the condensation of the white medullary matter in the hemispheres.

When a perpendicular incision is made along the lateral margins of the corpus callosum *w*, we come to large cavities, named the lateral ventricles,† which, when their roof is removed, as in Plate VI., exhibit three terminations, denominated cornua, and several bodies. A indicates the anterior cornu;‡ P, the posterior cornu;§ and I, the inferior cornu of each cavity.

The objects seen in each lateral ventricle are the corpus striatum G, the thalamus F, the tænia semicircularis *t* sepa-

* Syn. Brown nervous matter: The extreme vascularity both of the medullary and cortical substances should be carefully considered by the practitioner.

† Syn. Ventriculus tricornis: grand cavité du cerveau.

‡ Syn. Anterior sinus of superior ventricle.

§ Syn. Cavité digitale: Anchyroide.

rating these, the plexus choroides I, and the fornix K; these two cavities being apparently separated by the septum lucidum L. The corpus striatum G* situated in the middle and anterior part of the ventricle, is of an oblong pyriform shape, and of a reddish-brown colour, extends onwards into the anterior cornu A, and is bounded posteriorly or iniad by the tænia semicircularis *t*, and covered by the tunica arachnoides. This body, we shall afterwards find, has acquired its name from the crura cerebri, being radiated through its cineritious substance. These striated bodies begin to be formed about the third month of the fetal life.

The tænia semicircularis† is a bluish line extending between the corpus striatum G and the thalamus F, and is marked *t* in Plate VI. In the subject from which the drawings of this part were taken, it was a bold distinct vein; but in many, this vein is covered by a layer of medullary matter, so as almost to obscure, and give it only a bluish appearance. This vein can be traced to join the choroid plexus at its anterior aspect.

Tiedemann found in the seventh month of the fetus merely a groove between the corpus striatum and the thalamus; and not until the ninth month was this groove filled by vessels and medullary matter.

The choroid plexus has already been described, and the thalamus cannot be understood in this stage of the dis-

* Syn. Le corps cannelé: Grand ganglion cérébral superieur: Partie interne du grand ganglion cérébral superieur: Processus anterior medullæ oblongatæ: Processus lentiformis: Ganglion anticum.

† Syn. Geminum centrum semicirculare: Stria cornea sive semicircularis: Frenulum novum Tarini: Limbus posterior corporis striati Willisii: Tænia fibrosa corporis striati: Tænia striata: Bandelette semicirculaire: La lame cornée: La lame grise ou cendrée.

section; so that we must first examine the septum lucidum L.* This delicate partition extends from the corpus callosum *w* to the fornix K, and is found to consist of two medullary laminæ, which form a cavity, named the fifth ventricle,† as represented in *Fig.* 1 of Plate VII., and in Plate XIV. This cavity, marked 5, is found to communicate with the others at the foramen Monroianum M in Plate VI., or at the foramen commune anterius a, Plate VIII; its canal of communication, therefore, descends between the anterior crura k, k, of the fornix K in *Figs.* 2 and 3 of Plate VII., also in Plates VIII. and IX. In the fetus, the two laminæ of the septum lucidum are quite apart, and are not observed until the fifth month to extend from the two anterior pillars of the fornix (which are also separate, and hence a free communication presents itself between the third and fifth ventricle) to the corpus callosum.

The fornix‡ K in Plate VI., and in *Fig.* 1 of Plate VII., situated in the middle and posterior parts of the lateral ventricles, is a broad medullary expanse, which begins at the corpora albicantia *s*, *s*, of Plates X. and XIII., ascends by its two anterior crura *k*, *k*, to the floor of the lateral ventricles, where they unite and form a broad expanse, which runs backwards or iniad, resting on the thalami F, F, and continuing to expand as it extends backwards and mesiad into the posterior cornua P, P, to form the hippocampi minores§ *k*, *k*; and as it descends downwards and

* Syn. Septum medium cerebri: Cloison des ventricules: Cloison transparente: Septum pellucidum: Speculum lucidum.

† Ventriculum septi medii.

‡ Syn. La voûte à trois piliers: La masse commune de communication.

§ Syn. Unguis: Caveæ posterioris ventriculi lateralis: L'éperon: L'ergot: Petit hypocampe: Eminence digitale: Eminence unciforme.

forwards, or basilad and glabellad, resting on the crura cerebri, into the inferior cornu I, to form the hippocampi majores* k, k: one of these latter white eminences is observed in Plate IX. to run a long way onwards, its termination being named pes hippocampi, and its free margin, which overlaps the plexus choroides *i*, or is overlapped by it, the corpus fimbriatum.† This hippocampus major is considered the posterior crus of the fornix. The posterior part of the fornix forms a continuous substance with the corpus callosum, as may be easily understood from Plate V. On elevating the posterior part of the corpus callosum w, we raise at the same time the fornix, bringing into view its inferior or basilar surface connected with the choroid web; the impression which this web forms on the basilar surface of the fornix is termed lyra or psalterium; see *Fig.* 2, Plate VII., K. In this figure there is no appearance of a lyre, and it requires a considerable stretch of the imagination to perceive the resemblance. In the fetus of four months the fornix begins by two slender cords at a bulky shapeless mass (the corpora albicantia, in the base of the brain, marked *s*, *s*, in Plate X.), which ascend and unite under or basilad to the corpus callosum, then separate and extend backwards or iniad over the thalami, descending to the base of the posterior lobes of the hemispheres.

The choroid plexuses have been described in page 8.

The thalami nervorum opticorum‡ F, F, in Plate VI.,

* Syn. Cornu ammonis: Les grands hypocampes.

† Syn. Corps frangé: Corps bordé: Bandelette de l'hypocampe: Tænia hypocampi: Borde interne, concave, dentelé ou godronné.

‡ Syn. Colliculi nervorum opticorum: Optic chambers: Les couches optiques: Les grands ganglions cérébral inferieurs: Juga crurum medullæ oblongatæ: Ganglion posticum: Corpus striatum posterius.

in *Figs.* 1, 2, 3, and 4, of Plate VII., and in Plates VIII. IX. and XIV., are situated beneath or basilad to the fornix K, and choroid web i, *i*, forming the sides of the third ventricle 3, and partially seen in the lateral ventricles. They are of an oblong bulbous shape, narrower anteriorly than posteriorly, applied to each other by their mesial sides, bounded laterally by the tænia semicircularis *t*, and posteriorly or iniad by the corpora quadrigemina e, *e*; their mesial sides being connected by a cineritious band, named the commissura mollis, which is marked m, in *Fig.* 3 of Plate VII. This commissure is not found in the fetus till the ninth month. In this representation the thalami are separated a little to expose this commissure, while in Plates VIII. and IX. they touch each other, being drawn in their natural state in these diagrams. Three small elevations on the surface of the thalami are taken notice of by authors: the first, situated anteriorly, and marked f in *Fig.* 3 of Plate VII., and in Plates VIII. and IX., is named the anterior tubercle; the second situated posteriorly, and near the pineal gland H, is termed the inner or internal tubercle, or corpus geniculatum internum, and is marked *f*; and the third, situated exteriorly near the bold termination of the optic nerve, is styled outer or external tubercle, or corpus geniculatum externum: this latter has not been displayed, considering it unnecessary to give a figure for this individual point. The corpora geniculata will be described hereafter under the optic nerve. They are observed about the sixth month of the fetus. The thalami consist of medullary matter externally, and cineritious and medullary internally. They are visible in the fetus of seven weeks.

In Plates VIII. and IX., the foramen commune ante-

rius, or vulva, a, and the foramen commune posterius, or anus *a*, are represented, which form the sources of communication between the lateral and third ventricles. When the thalami, therefore, are held apart, we expose a cavity denominated the third ventricle,* marked 3, in *Fig*. 3 of Plate VII., which is formed superiorly and laterally by these thalami F, F, together with the commissura mollis, and inferiorly or basilad by the crura cerebri C, and tuber annulare E, as seen in Plate XIV. The iter ad infundibulum, marked I in *Fig*. 4., is observed leading downwards or basilad from the anterior or glabellar extremity of this third ventricle, the infundibulum † itself being marked *i*. This is a delicate tube, which leads to the pituitary gland‡ P, and which consists of cineritious matter, and is of a funnel-like shape, the base being turned to the third ventricle. The pituitary gland is a small round body situated in the sella turcica of the sphenoid bone, partially covered by the dura mater, and composed of the cineritious and medullary substances of the brain; the posterior or inial portion being medullary, and the anterior or glabellar being cineritious. The infundibulum descends only a short way into its substance. In the fetus of four months this body is quite hollow. The iter§ à tertio ad quartum ventriculum, indicated by a dotted line in *Fig*. 4 of Plate VII., and in Plate XIV., is observed leading backwards or iniad from the third ventricle. This canal is also partly

* Syn. Ventricule moyen du cerveau: L'intervalle entre les grands ganglions cérébraux inferieurs.

† Syn. La Tige pituitaire.

‡ Syn. Hypophysis sive glandula pituitosa.

§ Syn. Aqueductus Sylvii.

seen in this *Fig.* 4 of Plate VII., but this I shall describe afterwards, having still to mention how the two lateral ventricles communicate. In Plate VI. is seen a pretty large foramen, marked M, extending across to the opposite cavity, beneath or basilad to the anterior crura k, k, of the fornix K, and immediately anterior or glabellar to the apparent anterior extremities of the choroid plexuses *i*, *i*; and in *Fig.* 2 of Plate VII., where the fornix K has been cut across at this communication, and reflected back, this communication is further illustrated: it is termed the foramen Monroianum. When the thalami are held apart, and when we look anteriorly in the third ventricle, we observe a small white cord extending across, apparently between the anterior crura of the fornix, to which, however, it is anterior or glabellar: this is named the anterior commissure,* and unites the medullary matter of the one corpus striatum to that of the other. It is marked *c* in *Fig.* 3 of Plate VII., and in Plates IX. and XIV.; also in *Fig.* 4 of Plate VII. This anterior commissure is perceivable at the third month of the fetus. On looking backwards or iniad in the third ventricle, we perceive another white cord, marked *p* in *Figs.* 3 and 4 of Plate VII., and in Plates VIII. IX. and XIV., which is named the posterior commissure; this unites the medullary matter of the thalami, and is observed in the fetus towards the end of the third month. A small ovate or heart-shaped body, resembling in shape a pine-apple, and hence named the pineal gland,† seen in *Fig.* 3 of Plate VII., and in Plates VIII. IX. and XIV., marked H, is observed at-

* Syn. Commissura nævii æmula.

† Syn. Corps pineal: Conarium; Corpus turbinatum.

tached posteriorly to the mesial sides of the thalami, by two slender crura or peduncles, marked *h*. Where the peduncles run on the thalami, they are named by some authors the tracts of the pineal gland. This object consists chiefly of cineritious matter, and in the adult there is generally found a small quantity of sandy particles, named acervulus cerebri, which are not found in the fetus, and the gland itself is not observable till the fourth month. The peduncles consist of medullary matter.

The corpora quadrigemina are these four small round bodies, situated posteriorly and inferiorly or iniad and basilad to the pineal gland H; they are represented in *Figs.* 3 and 4 in Plate VII., and in Plates VIII. IX. and XIV., marked e, *e*. The two superior, e, e, are termed nates,* and the two inferior testes:† the superior or nates are somewhat larger, rounder or fuller than the inferior or testes, and are of a redder colour, consisting more of the cineritious substance. These four eminences form part of the roof of the *iter a tertio* (3) *ad quartum* (4) *ventriculum*, as represented in Plate XIV. by a dotted line. The corpora quadrigemina are observed in the fetus of two months in the shape of two membranous laminæ, separated by a longitudinal fissure, which become joined at the end of the third month, and then appear rounder and firmer.

* Syn. Corpora Bigemina superiora: Tubercula quadrigemina anteriora: Tubercules quadrijumeaux superieures ou anterieures: Tubercula anteriora: Protuberantiæ orbiculares: Protuberantiæ natiformes.

† Syn. Corpora Bigemina inferiora: Tubercula quadrigemina posteriora: Tubercules quadrijumeaux inferieures ou posterieures: Tubercula posteriora: Protuberantiæ minores.

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OF

THE LETTERS OF REFERENCE

IN

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y, Middle artery of the cerebrum

𝔟, Falx cerebri

2, Veins forming a communication with superior and inferior longitudinal sinuses

PLATE V.

B, Hemispheres of cerebellum
C, Spinal cord
E, Centrum ovale Vieussenii
V, Valve of Vieussens

a, Corpora bigemina superiora vel nates

e, Corpora bigemina inferiora vel testes
o, Anterior arteries of cerebellum
r, Valve of Tarin or Reil

4, Fourth ventricle

PLATE VI.

A, Anterior cornu of lateral ventricle
D, Dura mater
E, Medullary matter of hemisphere
F, Thalamus nervi optici
G, Corpus striatum
I, Inferior cornu of lateral ventricle
K, Fornix
L, Septum lucidum
M, Foramen Monroianum

P, Posterior cornu of lateral ventricle

i, Choroid plexus
k, Hippocampus minor
r, Posterior artery of the cerebrum
t, Tænia semicircularis
v, Artery of corpus callosum
y, Middle artery of the cerebrum

ȟ, Hippocampus major

PLATE VII. *Fig.* 1.

F, Thalamus nervi optici
G, Corpus striatum
K, Fornix
L, Septum lucidum

i, Choroid plexus
t, Tænia semicircularis
w, Corpus callosum

5, Fifth ventricle

PLATE VII. *Fig.* 2.

F, Thalamus nervi optici
G, Corpus striatum
K, Fornix

a, Foramen commune anterius
i, Vena magna Galeni
k, Anterior crus of fornix

i, Choroid plexus
i, i, *i*, Velum interpositum Halleri
t, Tænia semicircularis
w, Commencement of corpus callosum

Fig. 3.

F, Thalamus nervi optici
G, Corpus striatum
H, Pineal gland

a, Foramen commune anterius
e, Natis
f, Anterior tubercle of thalamus
k, Anterior crus of fornix
m, Commissura mollis

c, Anterior commissure
e, Testis
f, Corpus geniculatum internum
h, Peduncles of pineal gland
p, Posterior commissure
t, Tænia semicircularis
w, Beginning of corpus callosum

Fig. 4.

E, Tuber annulare
F, Thalamus nervi optici
H, Pineal gland
I, Iter ad infundibulum
P, Pituitary gland

e, Natis

c, Anterior commissure
e, Testis
h, Peduncles of pineal gland
i, Infundibulum
p, Posterior commissure
r, Posterior artery of the cerebrum

3, Third ventricle
19, Internal carotid artery

Fig. 5.

Section of the medulla oblongata

Fig. 6.

F, Corpus olivare

G, Corpus pyramidale

Fig. 7.

E, Tuber annulare
F, Thalamus nervi optici
O, Ophthalmic artery
R, Vertebral artery

q, Basilar artery

1, Olfactory nerve
2, Optic nerve
3, Motor oculi nerve
4, Pathetic nerve
5, Trigeminal nerve
6, Abducens nerve
7, Facial nerve
8, Auditory nerve
9, Glosso-pharyngeal nerve
9 *a*, Fifth cervical nerve
10, Nervus vagus, or pneumogastric nerve
11, Accessory nerve of Willis
12, Lingual nerve
19, Internal carotid artery
21, First cervical nerve
22, Second cervical nerve
23, Third cervical nerve
24, Fourth cervical nerve

A

SYSTEM

OF

ANATOMICAL PLATES;

ACCOMPANIED WITH DESCRIPTIONS,

AND

PHYSIOLOGICAL, PATHOLOGICAL, AND SURGICAL

OBSERVATIONS.

BY

JOHN LIZARS, F.R.S.E.,

FELLOW OF THE ROYAL COLLEGE OF SURGEONS, AND LECTURER ON ANATOMY AND SURGERY, EDINBURGH.

PART VIII.—THE BRAIN,

SECOND AND CONCLUDING PORTION.

COLOURED AFTER NATURE.

EDINBURGH:

PRINTED FOR DANIEL LIZARS, 61, PRINCES STREET, EDINBURGH;

S. HIGHLEY, 174, FLEET STREET, AND WEBB STREET, MAZE POND, BOROUGH, LONDON; AND W. CURRY, JUN. & CO. 9, UPPER SACKVILLE STREET, DUBLIN.

1825.

EDINBURGH:
Printed by John Brewster,
11 Society.

TO

JAMES BLUNDELL, M.D.

LECTURER ON PHYSIOLOGY AND MIDWIFERY IN THE UNITED
HOSPITALS OF ST. THOMAS AND GUY;

WHOSE INDEFATIGABLE RESEARCHES IN

PHYSIOLOGY AND PATHOLOGY,

HAVE SO ELUCIDATED ABDOMINAL SURGERY,

AS TO RENDER IT

AS SIMPLE AND SAFE AS THE AMPUTATION OF A LIMB;

THIS PART IS INSCRIBED,

BY HIS VERY OBEDIENT SERVANT,

THE AUTHOR.

PART VIII.—THE BRAIN,

SECOND AND CONCLUDING PORTION.

CONTENTS.

THE BRAIN.

A DELICATE medullary web or expanse, marked v, in Plates V. and XIV., is observed extending from the corpora quadrigemina e, *e*, to the cerebellum B; and in some instances, transverse striæ of cineritious matter are found on this web, which is named valvula Vieussenii;* it assists in forming the connecting link between the cerebrum and cerebellum, and contributes to form the iter à tertio 3, ad quartum ventriculum 4,† marked with a dotted line in Plate XIV. This canal is formed basilad or inferiorly by the crura cerebri g, and superiorly or coronad by the posterior commissure *p*, the corpora quadrigemina e, *e*, and this medullary velum v, also laterad, or on each side by all these bodies. The iter à tertio ad quartum ventriculum is apparent in the fetus of seven weeks, is very large at this period, and open superiorly or coronad, the two sides of the cerebral and cerebellic masses being separated; at eleven weeks, these bodies are found united, and the tube completed, so that

* Syn. Velum cerebri medullare: Velum interjectum Halleri: Valvula cerebri: Great valve of the brain: La lame medullaire du cervelet: Valvula: Frenulum: Voile médullaire supérieur du Reil.

† Syn. Aquæductus Sylvii: Canalis medius: Iter ad quartum ventriculum.

at this period the valve of Vieussens is also formed. The valve of Vieussens is connected laterally with the bold medullary substance, extending from the testis *e*, to the cerebellum B, which is termed the processus cerebelli ad testes,* and is marked *l*, in Plate XIV. This medullary process is part of the crus cerebelli, marked *n*; and is visible at the eleventh week of the fetal life.

The cerebellum B, B,† in Plates I. II. V. IX. X. XIII. and XIV., is that portion of the brain situated beneath or basilad to the tentorium *d*, resting on the two inferior depressions *u*, *u*, of the occipital bone in *Fig.* 3 of Plate IV. of Part I., and in Plate XI. of this Part, the same letters being employed, although the bone in the latter is invested with the dura mater. It is divided, like the cerebrum, into two hemispheres,‡ marked with the letters B, B, and by Malacarne, Reil, Bichat, and Gordon, subdivided into several lobes, lobules, and laminar leaflets; this subdivision, however, appears unnecessary, and has therefore been discarded. To enable the dissector to examine the cerebellum with any satisfaction, the whole brain must be removed from the calvarium. In Plates I. X. and XIII., we observe distinctly two hemispheres, which are separated by the falx cerebelli, marked 3, in Plate XI.; but in Plate IX. these are observed to be united, in consequence of the falx not extending so high up, or coronad, which bond of union has been fancifully named superior vermiform process;§ the

* Syn. The pillars of the Vieussenian valve: Superior peduncle: Ascending portion of the limb of the cerebellum.

† Syn. Parencephalis: Cerebrum posterius: Pars posterior cerebri: Le petit cerveau: Le cervelet.

‡ Syn. Globi cerebelli: Lobes du cervelet.

§ Syn. Le ver supérieur du cervelet: L'eminence vermiforme: Ligne médiane

inferior vermiform process being a continuation of this to the base of the cerebellum. The outer or peripheral surface of the cerebellum has a number of furrows, or sulci, which run horizontally, and somewhat regularly, but not so deep as those of the cerebrum, dividing it into laminæ or plates; and hence we observe a difference between the outer surface, or convolutions of the cerebrum, and these plates of the cerebellum.

When a section is made between the two hemispheres B, B, an elegant arborescent appearance presents itself, formed by the divarication of the medullary in the cineritious matter, which is named arbor vitæ; the root or concentration of which, marked *m*, in Plate XIV. is considered the commissure of the cerebellum, and forms the roof of the fourth ventricle,* marked 4, in Plate V., which is fully displayed when the two hemispheres B, B, are bisected, as in Plate XIV. The floor of the cavity is formed by the spinal cord C, and the tuber annulare, the sides by the crura cerebelli *n*, the anterior or glabellar margin by the valve of Vieussens V, and the posterior or inial, or inio-sacral margin, by the valve of Tarin *r*. These are seen partly in Plate V., and partly in Plate XIV. An expanse of the pia mater is described by authors as forming a tissue, like the choroid plexus in the lateral ventricles; but I have never witnessed any vascular plexus deserving this appellation. In Plate V., there is observed in this fourth ventricle, marked 4, a line extending longitudinally, which is named calamus scriptorius. The fourth ventricle, between the fifth and sixth week of the fetus, is

et ondulée des lobules supérieures du cervelet: Vermis superior: Epiphysis scolecoeides.

* Syn. Le ventricule du cervelet: The central fissure of the cerebellum.

an open cavity, communicating freely with a long canal or tube, extending along the spine, and with the third ventricle, and is not roofed in until the eleventh week. The valve of Tarin,* marked *r*, in Plate V., is a delicate medullary web, extending between the posterior part of the hemispheres B, B, of the cerebellum, and the spinal cord C, thus shutting up the fourth ventricle. This valve is perceptible at the seventh month of the fetal life.

The general medullary matter of the cerebellum appears produced from two processes or prolongations, named crura cerebelli,† marked *n*, in Plates XIII. and XIV., which are large roundish medullary pillars, extending upwards from the tuber annulare E, into the mass of the hemispheres, where they radiate to form the arbor vitæ,‡ as represented in Plates V. and XIV., and which are convex outwardly or peripherad, and slightly concave inwardly or centrad. In their ascent they form the sides of the fourth ventricle, marked 4, in Plates V. and XIV., and the commissure of the cerebellum,§ marked *m*, in Plate XIV. Their anterior, or glabello-coronal aspect *l*, Plate XIV., and *Fig.* 2 of Plate XII., is termed processus cerebelli ad testes,‖ and their posterior or basilar aspect, marked *o*, in Plates XIII. and XIV., and in *Fig.* 2 of Plate XII., which connects the medullary

* Syn. Inferior medullary valve of Reil: Valvulæ semicirculares, inferiores et posteriores quarti ventriculi: Posterior medullary velum of the cerebellum.

† Syn. Peduncles of the cerebellum: Racines du cervelet: Les bras du cervelet: Les jambes ou les petits cuisses du cervelet: Les petits branches de la moëlle alongée.

‡ Syn. Centrum medullare hemispheriorum cerebelli.

§ Syn. Mons cerebelli.

‖ Syn. Processus ad corpora quadrigemina: La portion ascendante des bras du cervelet: Le pédoncule supérieur du cervelet.

matter of the cerebellum with the spinal cord, is named processus cerebelli ad medullam oblongatam.* The aspect between these, which looks outward or peripherad, and descends to, or ascends from the tuber annulare, or pons Varolii, E, is marked *n*, in Plate XIII., and in *Fig.* 2 of Plate XII., and named processus ad pontem Varolii.† In making a slightly oblique section of the crus cerebelli, near the part where it branches out in the hemispheres, we perceive an oval-shaped serrated mass, of a delicate yellowish-red colour, named corpus dentatum,‡ represented in *Fig.* 3 of Plate XII., marked D.

In the fetus, between the fifth and sixth week after conception, the brain appears a sac, or pouch, with slight longitudinal and transverse depressions, presenting the appearance of several small vesicles agglomerated together; between the seventh and eighth week, the tentorium is seen separating the mass into cerebrum and cerebellum, and the latter consists of two thin narrow plates, which incline inward, and are applied to each other, but do not unite; at the ninth week, the processus cerebelli ad medullam oblongatam are found arising from the spinal cord, (which consists of two portions,) in the figure of two plates, bending forwards to meat each other, in order to form the cerebellum, the latter of which is very narrow and thin, ribboned, and convex without, and concave within; these two processes are not symmetrically applied

* Syn. Processus a cerebello ad medullam spinalem: Corpus restiforme: Le corps pyramidal postérieur: Colonne de la moëlle alongée: Portion descendante des bras du cervelet: Prolongement du cervelet vers la moëlle alongée.

† Syn. Processus anterior.

‡ Syn. Corpus ciliare: Corpus rhomboideum: Corpus serratum: Le corps dentelé: Le corps festonné du cervelet: Le corps frangé: Zigzag: Ganglion du cervelet: Le noyau.

to each other, the right advancing before the left. At the eleventh week, the crura or peduncles of the cerebellum extend forwards and outwards, or coronad and laterad, with a slight curvature, and are united by a narrow junction at the mesial or median line, and the external surface of the cerebellum is convex, smooth, and without furrows; at the fourth month, or between fourteen and fifteen weeks, the cerebellum is broader in its transverse or lateral diameter, than in the perpendicular or mesial line, and where the processus cerebelli ad medullam oblongatam may be said to enter the cerebellum, a small round swelling is visible, which appears to be the origin of the corpus dentatum; at the fifth month, the exterior surface presents the division into two hemispheres, each having four transverse lines or furrows, subdividing it into the five lobules of Reil, whose stems have no branches or ramifications, or divarications, as in the adult; at the sixth month, the transverse lines are very deep, and on making a perpendicular section, the ramification of the medullary matter is seen, as in the adult, and the processus cerebelli ad testes are fully developed; at the seventh month, the exterior surface presents a great number of transverse furrows, some of which penetrate more deeply than others; and when a perpendicular section is made, the stems, branches, and ramifications of Malacarne and Reil are observed, but not the leaves; at the eighth month, the cerebellum is nearly completed, the leaflets, however, are not so numerous as in adult life, and can be removed along with the pia mater, thus leaving the branches of the stems exposed; at the ninth month, the fissure separating the hemispheres is bold and distinct, the furrows are very numerous, the deepest of which separate the lobes, the less deep the

lobules, and the shallowest the leaflets or plates of Malacarne and Reil; the vermiform body, with all its divisions by these authors, as the short cross bands, the pyramid, the spigot, and the nodule, are developed; also the valve of Tarin, and the flocks, and the tonsils or almonds, of Malacarne and Reil.

I shall now proceed to the examination of the base of the brain; and to enable the dissector to examine this surface, the brain must be removed from the skull, by carefully dividing the various nerves, blood-vessels, and spinal cord, as they make their exit at the different foramina, having previously taken care to cut across on each side the tentorium cerebelli. Plates X. and XIII. represent the basis on which we observe the different convolutions of the cerebrum and lamellæ of the cerebellum, together with their divisions into hemispheres and lobes. The letters a indicate the anterior, *a* the middle, and a the posterior lobes of the cerebrum, the last of which are hid by the hemispheres B, B, of the cerebellum, in Plate X. In Plate XIII., these two great divisions of the brain appear to unite at E, the tuber annulare, by four large prolongations, named crura, those of the cerebrum being marked g, and those of the cerebellum *n*. The crura cerebri* g, g, are large round pillars of medullary matter, which ascend from the tuber annulare E, and radiate into the substance of the hemispheres, as seen in *Fig.* 4 of Plate XII. The crura cerebri are recognisable about the seventh week of the fetus, in the form of two lengthened cords.

The tuber annulare E,† Plate XIII., and *Fig.* 2 of

* Syn. Peduncles of the cerebrum: Processus medullæ cerebri.

† Syn. Pons Varolii: Protuberance annulaire ou semicirculaire: Ponticulus: Pons cerebelli: Protuberantia annularis Willisii: Protuberantia transversalis: Nodus encephali: Nodus cerebri: La grande réunion du cervelet.

Plate XII., is that large round eminence, apparently formed by the union of the crura cerebri g, g, and the crura cerebelli *n*, *n*, marked with transverse lines, and has a slight sulcus running perpendicularly or mesiad. The annular protuberance is observable at the fourth month of the fetus, being very narrow, and in the fifth month is clearly seen to be formed by medullary fibres, descending from the cerebellum, exterior to the processus cerebelli ad medullam oblongatam, and winding round the spinal cord, where they unite. Immediately anterior or glabellad to the tuber annulare E, and between the crura cerebri g, g, there is a small sulcus or aperture, which is named foramen cæcum anticum; and posterior or iniad and sacrad to the tuber E, and between the corpora pyramidalia G, G, is another sulcus or aperture named foramen cæcum posticum. Continuous with the tuber annulare E, and the crura cerebri g, g, et cerebelli *n*, *n*, downwards or sacrad, is the spinal cord, which on this aspect is observed to consist of four bodies, the corpora pyramidalia G, G, and the corpora olivaria F, F, the whole being named the medulla oblongata.* The corpora pyramidalia G, G,† are those oblong bundles of medullary matter, situate in the upper or atlantal region of the spinal cord, on its anterior or glabellar aspect, and which may be traced ascending within or centrad or corono-iniad of the tuber annulare E, to join or become the crura cerebri g, g. The corpora pyramidalia are not distinguishable till the fourth month, although the spinal cord is much more early

* Syn. Bulbus medullaris.

† Syn. Les éminences medianes: Corpora pyramidalia anteriora: Les éminences medianes du bulbe rachidien: Les corps olivaires: Corpora pyramidalia antica: Les bandes medullaires.

formed. The corpora olivaria F, F,* situate on the side of, or laterad to, the corpora pyramidalia, consist also of ascending medullary fibres. The corpora olivaria, although a component part of the spinal cord, which is very early formed in the fetus, are not fully developed until the seventh month. I shall defer the examination of the spinal cord, until I have finished the description of the base of the brain. Between the crura cerebri g, g, the tuber annulare E, and the tracts 2*, 2*, of the optic nerves 2, 2, are situated the two corpora mamillaria,† which are small round medullary eminences, that rest on the pituitary gland, and which form the commencements of the anterior pillars of the fornix. The corpora mamillaria appear as one large rude soft mass in the fetus of three months, and are not separated until the seventh month. Anterior or glabellad to the corpora mamillaria *s*, *s*, the infundibulum *i* is situated, which has been described in page 16 of Part VII.

The nerves which originate from the brain are divided by some authors into nine, and by others into twelve pairs; the latter of which arrangements I have preferred, as being more explicit. These are the first pair, or olfactory nerves, marked with the digits 1, 1; the second pair, or optic nerves, 2, 2; the third pair, or motores oculorum, 3, 3; the fourth pair, or pathetic nerves, 4, 4; the fifth pair, or trigemini, 5, 5; the sixth pair, or

* Syn. Corpora pyramidalia lateralia: Les corps pyramidaux: Corpora ovata: Corpus dentatum eminentiæ olivaris: Le ganglion ovale du grand renflement: Le ganglion olivaire.

† Syn. Apophyses: Corpora albicantia: Corpora candicantia: Tubercules pisiformes: Eminences mamillaires: Tubercules mamillaires: Les bulbes ou oignons de la voute à trois piliers: Tubera candicantia: Eminentiæ candicantes: Les éminences blanches.

abducentes, 6, 6; the seventh pair, or facial, 7, 7; the eighth pair, or auditory, 8, 8; the ninth pair, or glosso-pharyngeal, 9, 9; the tenth pair, or nervi vagi, 10, 10; the eleventh pair, or accessory nerves of Willis, 11, 11; and the twelfth pair, or lingual nerves, 12, 12.

The first pair, or olfactory nerves,* marked 1, 1, in *Fig.* 7 of Plate VII., in Plates X. XI., *Fig.* 5 of Plate XII. and Plate XIII., are delicate pulpy medullary objects, rather of a cineritious colour, deriving their origin apparently from the anterior lobes a, a, of the cerebrum, but which can be easily traced to arise from the medullary expanse of the corpora striata, which are hence named by Bichat, *couche du nerf ethmoidal*, and colliculus nervi ethmoidalis. In Plate XII. *Fig.* 5, the olfactory nerve of the left side is traced dividing into striæ, which are observed to come from the posterior or inial margin of the anterior lobe of the cerebrum, and to arise from the corpus striatum. As they proceed towards the cribriform lamella of the ethmoid bone, they form peculiar oblong turgescences, 1, 1, Plate X., which immediately before their emergence out of the cranium, 1,´1, Plates XI. and VII., divide into numerous small delicate threads, varying from twelve to fourteen in number, that are distributed on the mucous membrane investing the turbinated portions of the ethmoid bone, and the mesial septum of the nares. The olfactory nerves are not perceptible until the eleventh week of the fetus, and then they are very bulky, forming two little bands, which spring from the sylvian fissure, and end in a small round

* Syn. Olfactilia: Olfaciendi organa: Carunculæ mamillares: Processus medullares: Processus mamillares cerebri ad nares: Ductus nervei a media cerebri magnitudine ad supremam narium partem: Par primum, sive olfactorium, sive nervi olfactorii: Nervus olfaciens: Nerf ethmoidal ou olfactif.

tubercle; they are hollow, their cavity being continuous with the anterior cornu of the lateral ventricle, which is observable even in the seventh month.

The second pair, or optic nerves,* marked with the digits 2, in *Fig.* 7 of Plate VII., in Plates X. and XI., in *Fig.* 5 of Plate XII., and in Plate XIII., are large round nerves, which are observed in the two last of these Plates to twine round the crura cerebri g, g, where they are termed optic tracts, and are marked 2*; and their origins may be traced to the thalami F, F, and corpora quadrigemina e, *e*, as represented in *Fig.* 5 of Plate XII. The optic nerve, or optic tract 2*, is at first a flat medullary expanse, which in *Fig.* 5 of Plate XII., is observed to derive its origin partly from the thalamus F, and partly from the corpora quadrigemina e *e*, and, after descending round the crus g, of the cerebrum, becomes more condensed and cylindrical, unites with the opposite nerve 2, and again separates, in order to emerge from the cranium at the optic foramen, as delineated in Plate XI. The further course of this nerve will be traced in the Part comprehending the Organs of Sense.† We now observe the small elevation, which is named the corpus geniculatum externum f, in *Fig.* 5 of Plate XII., considered by some the commencement of this nerve. The optic tracts are flat onwards nearly to their union, and it is still undecided, whether this junction be merely a bond of union, or a decussation. Tiedemann found the nerves

* Syn. Prima nervorum a cerebro exorientium conjugatio: Nervus visivus seu visorius: Nervi optici sive secundæ conjugationis: Nerf oculaire ou optique.

† In Plate XI. the ophthalmic artery *o* is observed accompanying the optic nerve, a point of consideration for the practitioner in Amaurosis.

united in the third month of the fetus, and in the second month they were imperceptible; at the eleventh week, they were bulky, and could be traced into the thalami and the corpora quadrigemina; at the sixth month, the optic nerve, when raised from the crus cerebri, elevated along with it the corpus geniculatum externum, in the form of a layer, and the nerve could be traced into the thalami and corpora quadrigemina.

The third pair, or motores oculorum,* marked 3, 3, in *Fig.* 7 of Plate VII., and in Plates X. and XI., are moderately sized nerves, which are observed in the former of these to derive their origin from the crura cerebri, anterior to the margin of the tuber annulare E. Each nerve, however, can be traced to arise by two origins, the one running coronad and iniad, or upwards and backwards, to the medullary matter of the cerebellum; the other ascending coronad and glabellad, or upwards and forwards, between the crura cerebri, and along the thalamus, anterior or glabellar to the posterior commissure, until it is lost in the peduncle of the pineal gland. The nerve descends from its external origin to the side of the sella turcica, where it enters the cavernous sinus, as observed in Plate XI. to proceed out of the cranium, at the foramen lacerum anterius, to the muscles of the eye. These nerves are perceptible in the third month of the fetus.

The fourth pair, or pathetici,† marked 4, in *Fig.* 7 of Plate VII., and in Plates X. and XI., and in *Fig.* 2 of

* Syn. Second pair of Galen, Vesalius, &c.: Tertiæ conjugationis nervi of Vieussens, &c.: Nerf oculo-musculaire: Nerf oculo-musculaire commun: Nerf moteur commun des yeux ou de la troisième paire.

† Syn. Gracilior radix tertii paris of Vesalius: Par octavum of Fallopius: Nonum par of Columbus: Nervi quartæ conjugationis sive pathetici of Willis, &c.: Nerf oculo-musculaire interne: Trochleares.

Plate XII., are small delicate nerves, which derive their origin from the valve of Vieussens, marked v, in Plate V., and are hence connected both with the testes and cerebellum; they descend around the crura cerebri, to the folds of the tentorium, which they enter, as represented in Plate XI., and advance onwards through the cavernous sinus, as will be delineated in that Part on the Organs of Sense, to emerge at the foramen lacerum anterius, and to be expended on the superior oblique muscle of the eye. This nerve is observable in the third month of the fetal life.

The fifth pair, or Trigemini,* marked 5, in *Fig.* 7 of Plate VII., and in Plates X. and XI., large roundish-shaped nerves, appear to derive their origin from the side of the tuber annulare E, but each may be traced in the tuber annulare, dividing into two portions, the one ascending to join the crura cerebelli, the other ascending to the floor of the fourth ventricle. This nerve descends from its apparent origin at the tuber annulare, to enter the cavernous sinus, beneath or basilad to the tentorium, where it divides into its three branches, as will be described in that Part which treats of the Organs of Sense. This nerve is apparent in the fetus at three months.

The sixth pair, or abducentes,† marked 6, in *Fig.* 7 of Plate VII., and in Plates X. and XI., rather small nerves, appear to derive their origin between the tuber annulare E, and the medulla oblongata F, F, G, G, but each nerve may be traced upwards through the medulla oblongata to the corpus restiforme, or processus cerebelli

* Syn. Tertium par of Vesalius, &c.: Nervi gustatorii sympathatici medii: Tri-facial: Paire mixte.

† Syn. Radix gracilior quinti paris of Vesalius: Quartum par of Fallopius: Par octavum of Gaspar Bauhinus: Oculo-musculaire externe: Nervus timidus: Nerve oculaire externe: Nerf abducteur de l'œil: Nerf moteur oculaire externe.

ad medullam oblongatam. The sixth pair descend from the surface of the brain, to pierce the dura mater, investing the basis of the cranium, between the sella turcica and the foramen magnum, as represented in Plate XI. From this they advance onwards in the cavernous sinus to emerge at the foramen lacerum anterius, to supply the abductor muscles of the eyes. Their more minute description will be given under the organs of sense. This pair is observable in the fetus at the third month.

The seventh pair, or facial nerves,* marked 7 in *Fig.* 7 of Plate VII., and in Plates X. and XI., are small round nerves, which appear to derive their origin from the sides of the tuber annulare E, but each nerve may be traced through the substance of the tuber annulare, towards the floor of the fourth ventricle, dividing into two portions, the one ascending towards the cerebrum, the other descending to the cerebellum. This nerve proceeds almost directly across, accompanied with the auditory nerve, to the meatus auditorius internus, as delineated in Plate XI., the upper aperture of which it enters, and runs in the fallopian aqueduct, receiving a reflected twig from the vidian branch of the superior maxillary nerve, and giving origin to the chorda tympani, and twigs to the small muscles of the tympanum, as will be described in that Part which treats of the Organs of Sense. The nerve emerges at the foramen stylo-mastoideum, and is described in page 62 of Part II. This nerve is observable in the third month of the fetus.

* Syn. Pars quinti paris of Vesalius, &c. : Pars durior, vel potius nervus durus quinti paris of Fallopius : Ramus durior septimæ conjugationis : Communicans faciei : Portio dura of the seventh, the facial and auditory being formerly considered as one nerve.

The eighth pair, or auditory nerves,* marked 8, in *Fig.* 7 of Plate VII., and in Plates X. and XI., are large round soft nerves, which appear to arise from the sides of the tuber annulare E, but may be traced running upwards around the root of the processus cerebelli ad medullam oblongatam to the floor of the fourth ventricle. The auditory proceeds from the tuber annulare E, in company with the facial nerve, across to the meatus auditorius internus, as represented in Plate XI., the lower aperture of which it enters, dividing into minute filaments, to supply the labyrinth of the internal ear, as will be described under the Organs of Sense. This nerve is perceptible in the third month of the fetus.

The ninth pair, or glosso-pharyngeal nerves,† marked 9 in *Fig.* 7 of Plate VII., and in Plates X. and XI., derive their origin from the medulla oblongata, laterad or exterior to the corpora olivaria F, F, and proceed almost directly across to the foramina lacera posteriora, as represented in Plate XI., out of which they emerge, in company with the tenth, or nervi vagi 10, 10, the accessory nerves 11, 11, and the lateral sinuses *z*, *z*. The further distribution of these nerves is described in Part II. page 57. The origin of this nerve may be traced to the fourth ventricle, and the posterior part of the cerebellum. This nerve is observable in the third month of the fetus.

* Syn. Pars mollier quinti paris of Vesalius, &c. : Portion dure de la septieme paire ou du nerf auditif of Winslow, &c. : Nervus auditorius sive acousticus : Nerf labyrintheque : Portio mollis of the seventh, the facial and auditory having been formerly reckoned as one nerve.

† Syn. Pars sexti paris of Vesalius, &c. : Nervus anterior et minor sexti paris of Fallopius : Pars octavi paris : Par octavum : Petite portion ou première branche de la huitième paire : Pharyngo-glossien : Formerly part of the eighth, this, with the nervus vagus and accessory, having been considered one nerve.

The tenth pair of nerves,* marked 10, in *Fig.* 7 of Plate VII., and in Plates X. and XI., derive their apparent origin from the medulla oblongata, laterad or exterior to the corpora olivaria F, F, but can be traced to the fourth ventricle, and the posterior part of the cerebellum. They proceed almost directly across to the foramina lacera posteriora, as represented in Plate XI., out of which they emerge, in company with the ninth, or glosso-pharyngeal nerves 9, 9, the accessory nerves 11, 11, and the lateral sinuses *z*, *z*. The further distribution of this nerve is described in Part II. page 51. This nerve is observable in the third month of the fetal life.

The eleventh pair of nerves, or the accessory nerves to the nervi vagi,† marked 11, in *Fig.* 7 of Plate VII., and in Plates X. and XI., derive their origin from the posterior origins, or fasciculi, of the fourth, fifth, sixth, and sevent cervical pairs, within the theca vertebralis, as delineated in *Fig.* 7 of Plate VII., and in Plate II., ascend between the anterior and posterior fasciculi, enter the foramen magnum of the occipital bone, and proceed towards the nervi vagi 10, 10, which they accompany out of the foramina lacera posteriora, as described in Part II. page 57. These nerves are perceptible at the third month of the fetal life.

The twelfth pair, or lingual nerves,‡ marked 12, in

* Syn. Par sextum of Galen, &c. : Quinta conjugatio : Septimum conjugium : Sextum par : Nonus nervus capitis : Par octavum sive par vagum : Moyen sympathique, paire vague ou huitième paire : Nervus vagus : Pneumo-gastrique : Nerf vocal.

† Syn. Nervus spinalis sive accessorius ad par vagum : Nerfs accessoires de la huitième paire : Spinal or accessory nerve of Willis : Nerf spino-cranio-trapézien : Nerf trachélo-dorsal.

‡ Syn. Par septimum of Galen, &c. : Par octavum of Piccolhomini : Pars paris sexti of Casserius : Par decimum of Bartholinus : Par undecimum of Bidloo :

Fig. 7 of Plate VII., and in Plates X. and XI., appear to derive their origin from the medulla oblongata, between the corpora pyramidalia G, G, and olivaria F, F, as represented in Plate X.; but they can be traced into the medulla oblongata, dividing into two portions, the one ascending apparently to join the cerebrum, and the other descending to join the cerebellum.

Having finished the description of the nerves, I shall now proceed to that of the arteries of the brain. In page 40 of Part II., the internal carotid artery,* marked 19, in Plates VII. and VIII. of Part II., is described to its entrance into the canalis carotideus, (*t*, *Fig.* 2, Plate IV. Part I.) of the temporal bone; this artery is delineated in Plate II., in *Fig.* 7 of Plate VII., and in Plates X. and XIV. of Parts VII. and VIII.; in Plate II. it is merely represented ascending anterior, or sternad, to the bodies of the vertebræ X; but in Plate XIV., the artery is observed to ascend anterior to the vertebræ, and opposite to E, to become tortuous in its course through the temporal bone, which has been removed to exhibit this peculiar tortuosity. This winding course of the artery is also represented in some of the Plates illustrative of the Organs of Sense.

The internal carotid artery, after winding in its channel of the temporal bone, and by the side of the sella turcica of the sphenoid bone, where it is bathed in the blood of the cavernous sinus, and encircled by the threads of the

Par nonum of Willis: Grand Hypoglosse ou de la neuvième paire of Winslow: Nerf lingual ou de la douzième paire of Vicq D'Azyr: Nervus hypo-glossus, vulgo nervus lingualis medius sive nonus, quamvis sit nervorum cerebri revera duodecimus of Soemmering: L'hyo-glossien of Chaussier.

* Syn. Arteria carotis profunda: Arteria encephalica.

sixth pair and vidian, which form the great sympathetic nerve, emerges beyond the dura mater into the cavity of the cranium, as delineated in Plate XI.; and in this course gives origin to very small branches, which supply these nerves, and the third, fourth, and fifth pairs, which run in the cavernous sinus; also the dura mater in its vicinity, and the tunics of the carotid artery itself.

In Plate XI. the internal carotid artery 19 is observed after its entrance into the cranium, to give origin to a small branch, marked *o*, which is named the ophthalmic artery,* that emerges from the cranium at the optic foramen of the sphenoid bone, accompanied by the optic nerve 2; and which, before its emergence, gives off a small twig, that proceeds towards the olfactory nerve 1. The further distribution of the ophthalmic artery will be described under the Organs of Sense. The internal carotid, when minutely injected, is found, before its division into larger branches, to give origin to many small twigs or threads, which are ramified on the pituitary gland, the infundibulum, and the neighbouring parts.

The internal carotid artery, marked 19 in Plate X., ascends between the anterior a, and middle *a* lobes of the cerebrum, close to the optic nerve 2, and after a short course divides into an anterior v, a middle *y*, and a retrograde branch *t*. The last, or retrograde branch *t*, named lateral communicant, is either sent off from the trunk 19, before its division, as in this case, which, I may remark, is the general place of its origin, or it arises from the middle branch *y*. This small branch *t*, proceeds directly backwards or iniad, to unite with the posterior artery of the cerebrum *r*, the ultimate division of the basilar

* Syn. Ocular artery.

artery *q*; so that it may be said to be formed partly by each of these arteries.

The anterior branch v,* proceeds forwards and upwards, or glabellad and coronad, between the anterior lobes a, a, of the cerebrum, to the corpus callosum *w*, (as delineated in Plates IV. VI. VIII. IX. and XIV., but by mistake is marked *u*, in the last Plate,) along which this artery runs backwards or iniad, being gradually lost between the hemispheres, near the tentorium; and in this course, gives origin to numerous branches, the greater number of which supply the cerebral substance of the hemispheres, as illustrated by these Plates. The first conspicuous branch sent off, is marked *u*, in Plate X., which is observed to form a junction between the two anterior arteries v, v, and is hence named the anterior communicans. When the basis of the brain is first exposed, this branch is obscured by the tunica arachnoides, the approximation of the anterior lobes a, a, of the cerebrum, and by the optic nerves 2, 2. There are frequently more than one branch forming a communication between the anterior arteries of the cerebrum. No other branches of this artery are described, as they are very irregular. In Plate X. we observe several running on the surface of the two anterior lobes a, a, some of which are dipping into the substance of the cerebral matter, while others are inosculating with twigs of the middle branches *y*, *y*. In Plate XIV., which is a vertical section of the brain, the anterior artery, by mistake marked *u*, is seen ascending and running along the corpus callosum *w*, giving origin in this course to numerous branches, which ascend between the convolutions to the coronal surface of the hemisphere; some of

* Syn. Arteria callosa: Arteria cerebri anterior.

which run into the substance of the brain, and others inosculate with twigs of the posterior artery of the cerebrum, a branch of the basilar. In Plate II., several of the ultimate ramifications of this artery are seen, some of which terminate in the veins, while others anastomose with the small twigs of the middle artery of the cerebrum. In the different horizontal sections, represented by Plates VI. VIII. and IX., we observe the numerous subdivisions of this artery, indicated chiefly by the red dots in the anterior aspect of the cerebrum.*

The middle branch† of the internal carotid artery, marked *y*, in Plates X. IX. VI. IV. and II., ascends between the anterior a, and middle *a* lobes of the cerebrum, or in the fissure of Sylvius, to the exterior, or coronal and lateral surface of the hemisphere, as represented in Plates X. and II., where it inosculates with the twigs of the anterior and posterior arteries of the cerebrum; which inosculation is also delineated in Plate III. Before entering the fissure of Sylvius, this branch gives origin to twigs, which supply the crura cerebri, the base of the anterior and middle lobes, and the choroid plexus. In Plates IV. VI. and IX., is represented the manner in which the branches of this artery pierce the cerebral substance, and in comparing the two latter with Plate X. it will be easily understood, how this artery supplies the choroid plexus.

The two vertebral arteries, described in page 69 of

* This profuse distribution of blood-vessels, and their extreme delicacy, should be considered by the practitioner in determination of blood to the head, and in many diseases. The quantity of blood sent to the brain, compared with that to the rest of the body, is calculated by Malpighi to be one-third, by Haller to be one-fifth, and by Monro secundus to be one-tenth.

† Syn. Arteria Sylviana: Arteria cerebri media.

Part II., and represented in Plates I. and IV. of the same Part, marked R, also in Plate II., in *Fig.* 7 of Plate VII., in Plates X. XI., in *Fig.* 6 of Plate XII., and in Plate XIV. of the brain, ascend in the foramina of the transverse processes of the cervical vertebræ, anterior or sternal to the cervical nerves 21, 22, 23, in *Fig.* 6 of Plate XII., and enter the cavity of the cranium at the foramen magnum k, Plate XI. and in *Fig.* 6 of Plate XII., having previously pierced the dura mater and tunica arachnoides. The course of these arteries through the foramina of the five inferior or sacral cervical vertebræ is nearly straight, while that through the two superior, or the dentata and atlas, is fully more tortuous, as delineated in *Fig.* 6 of Plate XII., than the course of the internal carotids, immediately before their entrance into the cranium. On entering the cavity of the cranium, the vertebral arteries R, R, in Plate X., run along the medulla oblongata, and unite near the tuber annulare E, to form the basilar artery, marked *q*, which extends along the mesial line of this body, and at its anterior or glabellar margin, divides into the two posterior arteries *r*, *r*, of the cerebrum.

These ultimate branches *r*, *r*, ascend between the posterior lobes of the cerebrum and the hemispheres of the cerebellum, running on the former to the upper or coronal surface of the hemispheres of the cerebrum, where they unite with the ramifications of the middle and anterior arteries of the cerebrum, branches of the internal carotids. At their beginning, they give origin to the lateral communicants marked *t*, which, as mentioned in page 36, unite with either the trunk of the internal carotid 19, or with its middle branch *y*. These lateral communicants, with the ultimate division of the basilar artery, the

trunks of the internal carotid arteries 19, 19, their anterior branches v, v, and their anterior communicant *u*, form what is named the circle of Willis, thus effecting a free inosculation between the internal carotids and vertebrals, and shewing that little danger is to be apprehended from securing one of these arteries in the living body. From either these lateral communicants *t*, *t*, or from the commencements of the posterior arteries *r*, *r*, of the cerebrum, small twigs are sent off to the corpora mamillaria *s*, *s*, the infundibulum *i*, the optic nerves 2, 2, and the crura cerebri. As these posterior arteries ascend, they give origin to small branches, which supply the thalami, the corpora quadrigemina, the pineal gland, the choroid plexus, the fornix, and the third and lateral ventricles. These posterior arteries of the cerebrum are also seen in Plates VIII. and IX.

The vertebral arteries, in their course through the transverse processes of the vertebræ, give origin to small twigs, which enter the spinal canal, to supply the spinal cord and its tunics, as may be understood by examining Plate I. and *Fig.* 1 of Plate XV. Other branches, comparatively larger, emerge between the vertebral spaces, to supply the muscles of the neck, and to inosculate with the deep cervical and occipital arteries, the branches forming the junction with the latter, being marked *e*, in *Fig.* 6 of Plate XII.: those which form these anastomoses proceed from the trunk of the artery between the dentata and the atlas, and between the latter and the occipital bone. The vertebral artery, in its course between the atlas and foramen magnum, and before it pierces the dura mater, gives origin to the posterior artery of the dura mater, named posterior meningeal, which ascends between the occipital bone and the dura mater that encompasses the cerebel-

lum, to supply this membrane and the bone, as represented in Plate XI.; and generally inosculates with the middle meningeal artery.

Shortly after the vertebral arteries have pierced the dura mater, and entered the foramen magnum, they give origin to branches, which are named from their course anterior and posterior spinal arteries. The two posterior* are described descending on the posterior aspect of the spinal cord, anastomosing in their course downwards or sacrad with the small medullary branches of the vertebral, cervical, intercostal, and lumbar arteries, and also with the small branches of the anterior spinal arteries, to the cauda equina: but such a distribution is very seldom met with, as may be comprehended by examining Plate I. and *Fig.* 1 of Plate XV., which were drawn from two different subjects, one of which (Plate I.) was most minutely injected, while the other (Plate XV. *Fig.* 1) was taken from a young subject about three years old uninjected. In Plate I., these spinal arteries extend no length downwards or sacrad; and in *Fig.* 1 of Plate XV., there appears only one spinal artery descending and forming numerous inosculations with the medullary branches of the vertebral, cervical, dorsal, and lumbar arteries. These posterior spinal arteries frequently arise from the posterior or inferior cerebellar arteries.

The two anterior spinal arteries† are as small as the posterior, and derive their origin either from the vertebral arteries, or their junction the basilar; descend along the sternal aspect of the spinal cord for a short distance, and unite, continuing their course downwards or sacrad to the extremity of the cauda equina, and inoscu-

* Syn. Dorsal spinal arteries.

† Syn. Sternal spinal arteries.

lating with the medullary branches of the vertebral, cervical, dorsal, lumbar, and sacro-lateral arteries, and also with the posterior spinal twigs. The same irregularity exists in the extent of these, as in the posterior spinal arteries, for soon after their junction they often terminate, by inosculating with some of the medullary branches of the vertebral or cervical; the remainder, or sacral portion of the spinal cord, being supplied by the medullary branches of the intercostal, lumbar, and sacral arteries. After their union, and when this extends for any distance, the anterior spinal are more tortuous than the posterior spinal arteries. The medullary branches of the vertebral, cervical, intercostal, lumbar, and sacral arteries, like all small arteries, are very irregular, as is satisfactorily exemplified in Plate I., and *Fig.* 1 of Plate XV.

In Plate X., small branches marked *e*, are observed to arise, some from the vertebral arteries, and others from the basilar, which are named posterior or inferior cerebellar arteries;* those on the left side of the brain are two in number, while those on the right are three in number, the latter of which pursue the regular course around the medulla oblongata G, F, upwards to the basilar surface of the cerebellum B, B, and onwards even to its coronal aspect. In this course, they supply the corpora pyramidalia G, G, the corpora olivaria F, F, the lingual 12, the accessory 11, the pneumo-gastric 10, the glosso-pharyngeal 9, the auditory 8, the facial 7, and the abducentes 6, pairs of nerves; also the fourth ventricle, where they sometimes form a plexus, similar to the choroid in the lateral ventricles. These inferior cerebellar arteries are also seen in Plate IX.

* Syn. Arteriæ profundæ cerebelli.

When the basilar artery *q* has advanced to the anterior or glabellar margin of the tuber annulare E, it gives origin to the anterior or superior cerebellar arteries, marked *o*, *o*, Plate X., which wind round the tuber annulare E, ascending between the posterior lobes of the cerebrum, and the hemispheres of the cerebellum B, B, on the crura cerebelli, to the anterior and superior, or the glabellar and coronal aspect of the cerebellum. In this course, these arteries send branches to the tuber annulare E, the nerves in its vicinity, the crura cerebelli et cerebri, the velum interpositum of Haller, the pineal gland, the corpora quadrigemina, the valve of Vieussens, and the fourth ventricle. A small branch accompanies the facial and auditory nerves, to the meatus auditorius internus, to supply the internal organ of hearing, which is as frequently a direct branch from the basilar, as a subordinate one of the anterior cerebellar. In Plate X., this artery *o*, inosculates on the left side of the brain, with the posterior cerebellar artery *e*, and the vertebral artery R. The anterior cerebellar arteries are also seen in Plate V.

The other arteries which enter the cranium are distributed to the dura mater, and are named meningeal. The chief one is the middle meningeal,* marked 5* in Plates XI. and III., which derives its origin from the internal maxillary artery, as described in page 47 of Part II., enters the cranium at the foramen spinosum of the sphenoid bone, and ascends between the dura mater† and the bones of the cranium, imprinting the sphenoid, temporal, and

* Syn. Meningeal artery.

† When the meningeal artery is wounded, either by a blow on the head, or during the operation of trepanning, it may be easily secured by a ligature, by passing a curved needle between the vessel and the dura mater.

parietal, and supplying both these and the dura mater. Where the artery begins to imprint the parietal bone, which it does at its anterior inferior angle, or spinous process, it frequently forms for itself a complete canal or tube, from a line to a quarter of an inch in length.* These meningeal arteries are accompanied by venæ comites, which emerge at the foramina spinosa, and terminate in the internal jugular veins; and are very conspicuous in the fetal and youthful head. The other meningeal arteries are small subordinate twigs of the internal maxillary, the occipital, and the ascending pharyngeal, which enter the cranium at the foramen ovale and foramen lacerum posterius.

The veins which return the blood from the brain concentrate and form what are named sinuses. The veins marked with the digits 1, on the surface of the hemispheres, terminate in the superior longitudinal sinus, marked x,† as delineated in Plates I. II. III. IV. and XIV; in Plates III. and IV., these veins are observed to run from behind forwards, or from the inial to the coronal aspect, by which the venous circulation is apparently rendered tardy in its course. The superior longitudinal sinus x, begins about the crista galli of the ethmoid bone, as represented in Plates III. IV. and XIV., ascends in the

* In injuries of the head, in consequence of the meningeal artery being imbedded in the bone, it is very liable to be ruptured, apparently from the coats of the vessel not being able to yield when the blood is violently agitated by the shock; and when the operator conceives that blood is extravasated here, the course of the artery in the spinous process of the parietal bone may be ascertained by dividing the space between the external angular process of the frontal bone, and the centre of the external auditory meatus, into two proportional parts, and raising a perpendicular from this central point. The artery will then be found to run centrad of, or underneath, this perpendicular line, for some extent, coronad or upwards.

† Syn. First sinus.

middle or mesial line of the cranium,* running backwards or iniad to the tentorium, where it divides, and forms the two lateral sinuses marked *z*, in Plates II. IX. XI. and XIV. In the posterior or inial region of the superior longitudinal sinus, small threads of fibres are found stretching across, which are named chordæ Willisii, or Willisianæ; and where the different veins terminate in this sinus, there are elongations of the venous membrane with their free edges pointing forwards or glabellad into the cavity of the sinus, answering the purpose of valves. Similar fibres, threads, and membranous elongations, are observable in the lateral sinuses.

Each lateral sinus *z*, Plate XI.,† runs round in the folds of the tentorium *d*, to the petrous ridge of the temporal bone,‡ where it descends downwards or basilad, running a circuitous course in its groove of the occipital, parietal, and temporal bones, as displayed in Plate IV. *Fig.* 3 of Part I., marked *z*, *i*, *z*, to the foramen lacerum posterius, marked *w*, where it emerges out of the cranium,

* Since the superior longitudinal sinus or vein is strongly protected by the dura mater, as represented in Plate III., (for the veins supported by the dura mater possess the same tunics as other veins,) the operator may apply the trephine in this region, without any risk of wounding the vessel, if he proceeds with caution. This sinus must be carefully guarded against, when operating for the removal of water, in either acute or chronic Hydrocephalus.

† Syn. First and second sinuses of the ancients.

‡ The superior longitudinal sinus *x* divides into the two lateral, precisely opposite the protuberance of the occipital bone, and the lateral sinuses imprint the internal aspect of the mastoid processes of the temporal bones, so that by means of these processes of the occipital and temporal bones, the operator can calculate the course of these sinuses, and hence avoid them when applying the trephine in these regions. Beneath or basilad to the petrosal ridges, the trephine cannot be easily applied. In very rare instances, the superior longitudinal sinus has been found to divide at the beginning of the lambdoidal suture; but this deviation I have never witnessed.

and becomes the internal jugular vein, the course of which is described in page 51 of Part II. In this course, the lateral sinuses receive several veins or sinuses; indirectly the inferior longitudinal sinus G, Plate IV., which collects the blood from between the hemispheres, and from the surface of the corpus callosum, beginning at the anterior, or glabellar, or ethmoidal attachment of the falx cerebri D, and extending backwards or iniad in its folds to the tentorium *d*, Plate VIII., where it meets with the vena magna Galeni i, that collects the blood of the lateral, fifth, and third ventricles, together with the choroid plexuses and velum interpositum Halleri. The inferior longitudinal sinus G, uniting with the vena magna Galeni i, forms the fourth sinus,* mark IV. in Plates XIV. XI. and VIII., which runs backwards or iniad in the folds of the tentorium *d*, and terminates directly in the commencement of one of the lateral sinuses, which is almost invariably the left; sometimes, however, it ends in the superior longitudinal at its division into the two lateral sinuses; and the enlargement formed by this junction of the fourth with the left lateral, is named the torcular Herophili.† Considerable irregularity or variety is found both in the inferior longitudinal and the fourth sinus. The lateral sinus throughout its course receives several small veins directly from the cerebrum and cerebellum, similar to those which join or form the superior longitudinal; and the same arrangement of small veins is observable with respect to all the sinuses. In Plate IV.,

* Syn. Synus quartus perpendicularis: The internal sinus: The straight sinus: The torcular Herophili.

† Syn. Lenos Herophili: Pelvis: Laguncula: Palmentum: Tertia Vena: Platea: Lacuna: Cisterna.

several small veins are delineated, running in the folds of the falx cerebri D, forming a communication between the superior *x*, and the inferior longitudinal G, sinuses, some of which are marked 2. Sometimes the one lateral sinus is larger than the other, and the right branches off the higher of the two, appearing to be the continuation of the superior longitudinal sinus; and Lieutaud mentions, that the left was deficient in one instance: again, in some cases, one of the lateral sinuses is the continuation of the fourth sinus, and has no connexion with the superior longitudinal, or the other lateral sinus, the latter of which is then very large; at other times, the occipital sinus has been found conveying the greater portion of the blood of the superior longitudinal, and extending around the foramen magnum to the foramina lacera posteriora, while the lateral sinuses have been found very diminutive. The lateral sinuses are observed sometimes to terminate in the external jugular veins.

The blood circulated by the ophthalmic arteries in the orbits, is returned into the cranium by the ophthalmic veins or sinuses, which enter at the foramina lacera anteriora, and terminate in the cavernous sinuses, one of the latter of which is marked c, in Plate XI. The ophthalmic veins will be represented in that Part which illustrates the Organs of Sense; so also will the cavernous sinuses. In Plate XI. of the brain, the cavernous sinus is shut up by the folds of the dura mater, which form its outer walls; when laid open, it is of an irregular triangular shape, extending from the pituitary gland to the spinous foramen of the sphenoid bone, and has a number of fibrous threads which traverse and give it a cellular appearance. A very small vein runs round the termination of the infundibulum *i*, at the pituitary gland,

between the latter and the dura mater, and terminates in the cavernous sinus, which is named the sinus of Ridley,* and which frequently cannot be observed, from its minuteness. Each cavernous c, Plate XI., ends in the superior petrosal sinus *p*, which is observed to run along the petrosal ridge of the temporal bone, in the folds of the tentorium *d*, and to end in the lateral sinus *z*. An inferior petrosal sinus, and an occipital sinus, are described by authors, but they are so irregular and small, that they appear not to deserve attention. The inferior petrosal, when present, extends along the angle formed between the squamous and petrous portions of the temporal bone to the lateral sinus.

An occipital sinus is found occasionally in the folds of the falx cerebelli ∂, ending in one of the lateral sinuses, at the torcular Herophili, which sinus is sometimes double. In Plate XI., several small veins are delineated ascending between the dura mater and the occipital bone, and ending in the lateral sinuses, which are named by some authors the inferior lateral sinuses; sometimes similar veins are found on the cuneiform process of the occipital bone, and are named either petrous or lateral basilar sinuses, with a middle basilar sinus. A small vein is occasionally found extending across the cuneiform process near the posterior clinoid processes, forming a junction with the preceding lateral basilar sinuses, and is termed the transverse or posterior clinoid sinus. Two sphenoidal sinuses are also described; the one situated on the margin of the transverse spinous process of the sphenoid bone, named the superior, receiving blood from the orbit and dura mater, and emptying itself either into the oph-

* Syn. Posterior clinoid sinus, or elliptic sinus.

thalmic or cavernous sinus; the other, the inferior, which is situated on the cerebral or interior surface of the temporal process of the sphenoid bone, empties itself also into the cavernous sinus. These different small sinuses are so irregular, that they need not be taken into consideration, still less committed to memory, by the pupil.

The vertebral sinuses begin near the foramen magnum, and generally inosculate with the occipital and lateral basilar sinuses, descend in the beginning or atlantal aspect of the tube between the theca vertebralis and the vertebræ, then in the foramina of the transverse processes of the cervical vertebræ, and join the subclavian veins, as described in Part II., p. 69, and delineated in Plate I. of the same Part, collecting the veins from the spinal cord, and its membranes, in the region of the neck. The veins or sinuses which descend in the vertebral tube, between the theca vertebralis and the vertebræ, collect the blood from the spinal cord and its membranes, and form communications with the intercostal, lumbar, and sacral veins.

Besides these veins of the dura mater, and those of the brain, which empty themselves into the former, there are a number of small veins running through the various little foramina of the bones of the cranium, described in Part I., forming a communication between the sinuses and the exterior veins of the head; some of which run from without inwards, emptying themselves into the sinuses, while others emerge and join the exterior veins, but do not communicate with the sinuses; these are named the emissaria Santorini, or Venæ emissariæ.

I shall now describe the spinal cord.* This, which is

* Syn. Le prolongement rachidien: Spinal marrow: Vertebral marrow.

represented in Plates I. II. V., in *Figs.* 5, 6, 7, of Plate VII., in Plate X., in *Fig.* 1 of Plate XII., and in Plates XIII. and XIV., marked C, is continuous with the cerebrum and cerebellum, and like them consists of cineritious and medullary matter. It is seen in Plate I. and in *Fig.* 1 of Plate XII., letters C, to be a long cord of a roundish figure, encased in the spinal canal, and surrounded or protected by its membranes, the dura mater d, the arachnoid membrane *e*, and the vascular pia mater, the same as the cerebrum and cerebellum.

The spinal cord is considered by some to consist of four columns, two ascending to the cerebrum, and two descending from the cerebellum; by others, to consist only of two columns, the latter of which is substantiated by the indefatigable researches of Tiedemann, as will be shortly detailed. In the adult, the spinal cord, which appears to be a continuation of the cerebrum and the cerebellum, is larger at its commencement, where it is named the medulla oblongata,* marked G, G, F, F, in Plates X. and XIII., and tapers gradually in its descent to the second lumbar vertebra, where it ends by a conical point. In this extent, slight variations occur in its transverse diameter, as, for example, in the cervical portion, it is greater in the sacral than the atlantal extremes, which occurs also in the dorsal portion. Soemmering takes notice of a double swelling in this latter portion; but this is not always present. The cord has a fissure both on its anterior or sternal surface, and on its posterior or dorsal aspect, the latter of which is the more evident, as will be better understood from the fetal description. At this lat-

* Syn. Principium medullæ spinalis: Pars cephalica medullæ spinalis: Le bulbe rachidien: Cranial portion of the cord.

ter fissure, the pia mater entered, and the cineritious matter was deposited, the exterior of the spinal cord consisting of medullary matter, as represented in the sections displayed in Plate V., in *Figs.* 5 and 6 of Plate VII., and in Plate X. When the corpora pyramidalia g, g, are held apart, as in *Fig.* 6 of Plate VII., there are observed extending across the anterior fissure, small transverse fibres, which have been hitherto considered a decussation of the medullary fibres of the corpora pyramidalia; but Tiedemann observes, that these fibres are scarcely sufficiently numerous to warrant the conclusion of a complete decussation of the chief cords of the spinal marrow; he witnessed in the fourth month, some of the fibres proceeding from behind forwards from the right bundle to the left pyramid, and others from the left bundle to the right pyramid.

Throughout the extent of the spinal cord, the different spinal nerves derive their origin, and are variously arranged or divided by authors; by some, they are classed into eight cervical, twelve dorsal, five lumbar, and five sacral nerves, making in all thirty pairs, which is the most common arrangement; by others, the first cervical, which are also named the sub-occipital pair, are classed along with the cerebral nerves; a third arrangement is classing the glosso-pharyngeal, the nervi vagi, the lingual, and the accessory among the spinal nerves, making the cerebral only eight in number. Of these, the first and most ancient is as good as any other, all of them being arbitrary; and as the whole nerves are derived from the nervous centre, the brain and spinal cord, there appears less necessity for such divisions or classifications, which, on this very account, do not admit of a perspicuous arrangement. Thus we have seen so many nerves derive their sole origin

from the cerebrum, others from the cerebellum, others again partly from the one organ, and partly from the other; hence it would be fastidious to class the nerves into cerebral, cerebellar, and cerebro-cerebellar. Again, the nerves apparently arising from the medulla oblongata, which is strictly a portion of the spinal cord, would require to be classed separately, and here the sixth pair interferes; so that the old arrangement into cerebral and spinal nerves, is probably as good and perspicuous as any other. In Plate II. the spinal nerves are observed to have double origins from the spinal cord, the one fasciculus arising from the anterior or sternal aspect of the cord, and the other from the posterior or dorsal aspect. In Plate I., and *Fig.* 1 of Plate XII., which are both posterior views, we observe the medullary substance of the cord terminating as it were in a leash of nerves, which is named the cauda equina.

The fetal developement of the spinal cord throws more light on its organization, than all the dissections of anatomists. I formerly mentioned, that when the head and trunk of a fetus, between the fifth and sixth week, are examined, a canal or tube is found, containing a whitish and almost diaphanous fluid, the canal forming a rounded pouch in the head. At the seventh week, the spinal cord, bent like the spinal column, is very large and thick, compared to the size of the embryo, and particularly to that of the brain; it possesses the same thickness throughout its whole extent, has a pulpy white appearance, of the consistence of the white of an egg, and is marked on its posterior or dorsal aspect by a longitudinal groove into which the pia mater penetrates; the margins of this groove are very thin, and if separated by a flat needle, and held aside, the inner canal is continuous with the

fourth ventricle, and extends to the end of the cord, like that in the horse, and many other quadrupeds. The anterior or sternal surface of the cord consists of two strings or cords, separated by a slight longitudinal furrow. At the upper or atlantal extremity, the cord, after bending forwards, forms on each side a considerable projection, corresponding to a tubercle at the nape of the fetus; and above, or coronad to this projection, the canal is dilated, where it is continuous with the fourth ventricle. The substance of the cord and brain, when examined at this period of life with a suitable magnifier, appears to possess no fibrous structure, but to consist of extremely minute globules. At eleven weeks, the spinal cord extends along the back to the region of the sacrum, where it terminates in a point without caudiform expansion; it appears a little thicker only at the origin of the nerves of the pectoral and pelvic members, but its bulk is much augmented at the upper or atlantal extremity, where it is continuous with the brain. The two sides of the spinal cord give origin to the spinal nerves, the bulk of which is very considerable. The medulla oblongata is perceptibly thicker and broader, and inclines forwards, but the pyramidal and olivary eminences are not yet visible; its margins, or the restiform bodies, separate to form the fourth ventricle, while before and below, or glabellad and basilad, they are continuous with the crura cerebri, the annular protuberance not yet being formed. At the fourth month, the pyramidal bodies appear in the form of two oblong eminences, but the lateral surfaces are plain and uniform, there being no appearance of the corpora olivaria. Fibrous or linear portions can now be detached from the surface of the cord, along its whole length, but none transversely. Each half of the cord at the medulla

oblongata divides into three bundles, the posterior or restiform body, the middle, or that which subsequently forms the corpus olivare, and the anterior or pyramidal body, and which with the middle bundle is subsequently continued into the crus cerebri. The annular protuberance is now for the first time apparent, formed by medullary bands descending from the cerebellum.

At the fifth month, the spinal cord terminates at the sacrum, in a delicate filament, and the nerves arise distinctly by anterior and posterior roots. If a small blowpipe be inserted into the calamus scriptorius, with its point downwards or sacrad, the whole canal may be distended with air. Some of the fibres of the pyramidal bodies cross each other, and are continued forwards, above, or corono-iniad to the annular protuberance, to form the crura cerebri.

At the sixth month, the pyramidal bundles may be seen to cross at their inner edge, and proceed forwards, to traverse the annular protuberance, with the transverse fibres of which they are covered, and partly intermixed, and terminate in the crura cerebri. The olivary bodies, though broad, are still flat, and without the proper olive-shaped eminences; their component fibres do not mutually cross, but proceed forwards through the annular protuberance, and are then applied to the upper and outer part of the corpora pyramidalia, and contribute with them to form the crura cerebri: from these bundles, also fibres penetrate into the walls of the common mass of the corpora quadrigemina, some uniting with the corresponding ones of the opposite side, and others going forwards to the thalami.

At the seventh month, the spinal cord terminates in a point extending to the last lumbar vertebra, and in bulky

nervous threads corresponding with the caudiform expansion. The capacity of the canal is diminished, and its walls are covered with a thin layer of unfibrous or cineritious substance, which adheres in patches to the folds of the pia mater destined to clothe the canal. Each of the olivary bundles now support an olivary oval-shaped body, consisting of non-fibrous or cineritious pulp, deposited on the surface of the cerebral fibres, which proceed forwards or coronad to the common mass of the corpora quadrigemina.

At the eighth month, the canal of the spinal cord still exists, although much contracted by a soft vascular matter deposited on its inner wall.

At the ninth month, the spinal cord extends near the third lumbar vertebra, where it forms a considerable caudiform expansion; its dorsal portion is a little larger in its transverse diameter, as well as in those portions which give origin to the brachial and crural nerves. The pia mater, extremely vascular, penetrates by the anterior and posterior fissures, the latter of which, or the canal, is now small and narrow, and its walls support a thick bed, of a soft reddish substance, the cineritious matter, throughout which is distributed a multiplicity of vascular ramifications, produced by the pia mater, and which substance is most abundant at the origin of the nerves.

I have now demonstrated the brain according to the method of Vesalius, which is most generally practised in the schools, and shall next proceed to the description of the mode ascribed to Willis, and the Grecian anatomists. This consists in raising the posterior lobes of the cerebrum from the cerebellum, when we arrive at the corpora quadrigemina and the pineal gland, and penetrate between the lower or basilar surface of the fornix, and the tha-

lami, exposing at the same time the velum interpositum of Haller. We thus bring at once into view all the cavities, and if the arachnoid membrane and pia mater be removed, we observe their manner of communication. We perceive on each side of the fornix, which is now reflected forwards, the two lateral ventricles freely exposed, their roof formed by the corpus callosum and the contiguous medullary matter of the hemispheres, both of which are also reflected forwards. We perceive the septum lucidum, likewise reflected forwards and inverted, extending between the corpus callosum and the fornix, with the aperture which leads to its cavity, or the fifth ventricle, situated between the anterior crura of the fornix. We see, on the same level, the corpora striata, the tæniæ semicirculares, and the thalami, with the pineal gland a little below this level, the corpora quadrigemina still lower, and the valve of Vieussens beneath the latter bodies, and lastly the cerebellum, which rises to the level of the thalami. We observe between the thalami, the commissura mollis, with the foramen commune anterius immediately before or glabellad leading to the third ventricle and infundibulum, and glabellad to this foramen, the anterior crura of the fornix, with the anterior commissure extending across between the crura, but anterior or glabellad; posterior or iniad to the commissura mollis, we perceive the foramen commune posterius, with the pineal gland and its peduncles behind or iniad, and beneath or basilad to the latter, the posterior commissure, and still lower or basilad to the last, the iter à tertio ad quartum ventriculum, the roof of which channel is formed by this posterior commissure, the corpora quadrigemina and the valve of Vieussens. This method, therefore, enables us to comprehend the nature, extent, and com-

munication of the ventricles better than any other. I have not given a drawing of this mode, as it is extremely simple to understand, and easily displayed on the subject; it is probably more easily developed on the brain of the sheep than in that of man, in consequence of the smallness and shortness of the posterior lobes of the cerebrum. The reader may easily follow the above description, by comparing Plates II. V. VII. VIII. IX. and XIV.

It now remains to describe the brain after the manner adopted by Varolius and Vieussens, and followed by Gall and Spurzheim, which is the most natural order; at the same time keeping in view the researches of Tiedemann concerning the early formation of the brain. The chief objection to the description of Varolius, Vieussens, and Gall and Spurzheim, is, their considering the cerebellum and cerebrum to be produced by the spinal cord, an idea satisfactorily confuted by Tiedemann, who found, in the embryo between the fifth and sixth week after conception, a canal or tube, occupying the head and spine, filled with a whitish and nearly diaphanous fluid, which swelled out in the form of a round pouch in the head. This whitish fluid became gradually firmer, until it assumed the appearance and character of cerebral matter; so that the nervous system, as early as it is discernible, consists of the brain and spinal cord, and hence we may begin its description at any point. The supposition that there are four columns constituting the spinal cord, the two anterior being the ascending, and the two posterior the descending, is quite hypothetical, for, according to Tiedemann's researches, no such division can be found in the early state, where an open fissure, continuous from the fourth ventricle to the cauda equina only presents itself.

I shall begin with the medullary fibres G, G, of the cor-

pora pyramidalia, in *Fig.* 4 of Plate XII., and in Plates XIII. and XIV.; in Plates XII. and XIV. they are observed to ascend through the cineritious substance of the tuber annulare E, forwards or glabellad through that forming the corpus niger N,* diverging upwards or coronad in the crura g, g, cerebri, radiating upwards and forwards, or coronad and glabellad, into the thalami f, and into the corpora striata G*, and lastly terminating in the hemispheres A, A, Plate XV. The olivary bundles of medullary fibres partly join those of the corpora pyramidalia to constitute the crura cerebri, and partly form the corpora quadrigemina e, *e*. The medullary fibres of the processus cerebelli ad medullam oblongatam *o*, or restiform bodies, Plate XIII., and *Fig.* 2, Plate XII., ascend to form the cerebellum. Some of the fibres of the corpora pyramidalia descend to the corpora mamillaria. The preceding is the manner in which the medullary fibres are traced by Varolius, Vieussens, and Gall and Spurzheim, combined with the modification consequent on the discoveries of Tiedemann, the latter of which I shall now detail in a connected order, to confirm the above.

Under the description of the spinal cord, I traced the medullary fibres of the pyramidal bundles through the tuber annulare into the crura cerebri; but I shall retrace the description to the fetus at the seventh week. At this period, the crura cerebri are in the form of two lengthened cords, at the bottom of the aqueduct of Sylvius, which is very large and open. From the summit of the crura or cords, membranous and inverted figures corresponding to the corpora quadrigemina, arise; anterior to which, two round protuberances, the thalami,

* The corpus niger is merely a little cineritious matter, extremely vascular, the veins of which contribute to deepen the colour; and hence the term black.

are seen separated above by the aqueduct of Sylvius, but joined below or basilad, where they are supported or formed by the crura cerebri; still more anterior to these last, and joined or applied to them, two other eminences, the corpora striata, are observable: lastly, from each of these latter, a membranous production extends inwards and backwards, or centrad and iniad, to form the hemispheres of the cerebrum. The spinal cord, immediately posterior or iniad to the crura cerebri and the corpora quadrigemina, gives off a thin narrow plate, which inclines inwards, but does not unite to form the cerebellum, as described in page 23. The dura mater, at this period, is found enveloping the brain and spinal cord, and dividing the cranial cavity into two equal parts, through the medium of the tentorium. The pia mater adheres intimately to the cerebral substance. At nine weeks, the corpora quadrigemina appear two oblong oval eminences, convex and smooth above, separated by a longitudinal furrow, and formed by two plates, mutually inclining towards each other, which issue from the crura cerebri. The thalami appear convex and smooth above, forming between them the third ventricle, which communicates freely and openly with the aqueduct of Sylvius, and the fourth ventricle. The corpora striata appear two distended bodies, from which the cerebral substance in the form of a thin membrane bends backwards and inwards, or iniad and centrad, to form the rudiments of the hemispheres.

At eleven weeks, the dura mater is seen to penetrate between the hemispheres, so as to form the falx cerebri; the tentorium is well marked; the longitudinal and lateral sinuses are formed; the pia mater of some thickness is observed forming the choroid plexus; and the restiform bodies, at their anterior and inferior, or gla-

bellar and basilar aspect, are seen to be continuous with the crura cerebri, which union is very distinct, in consequence of the annular protuberance not being yet formed. On the upper or coronal aspect of the brain, are seen the cerebellum, the rudiments of the corpora quadrigemina, uncovered by the hemispheres of the cerebrum, which are very minute, and are separated by a deep fissure. On the inferior or basilar aspect, are seen the crura cerebri, anterior or glabellar to which a large mass, indicating the commencement of the mamillary eminences, the pituitary gland hollow and communicating with the third ventricle by the infundibulum, the union of the optic nerves, the olfactory nerves very short and ending in a bulbous enlargement, and the two hemispheres of the cerebrum, the middle and posterior lobes being mingled together.

The rudimental substance of the corpora quadrigemina is divided into two portions by a slight longitudinal furrow, which does not penetrate into the aqueduct of Sylvius, this being now shut up by the union of these bodies, and by the extension of the valve of Vieussens. The thin walls of the corpora quadrigemina inclose a spacious cavity continuous before with the third, and behind with the fourth ventricle.

The thalami now appear in the form of two oblong smooth convex massive eminences, which, when separated, expose the posterior commissure, and the third ventricle, onwards to the infundibulum. The anterior lobes of the cerebrum are now distinct, but the middle and posterior resemble two appendages, placed before and on the sides of the crura cerebri; all of them are smooth on the surface, there being no appearance of furrows or convolutions. When the falx is removed, and the hemispheres

held apart, the thalami and third ventricle are seen, the corpus callosum and fornix not yet being formed. Anterior or glabellad to the thalami, the hemispheres are joined by the origin or generative point of the corpus callosum: these resemble two membranous vesicles, about the fourth of a line thick, containing the choroid plexus of enormous bulk, and, when everted, they are seen to be formed by the fan-like expansion of the corpora striata, which bodies are now more fully developed. The membranous hemispheres, after bending backwards and inwards, to form the ventricles and cover the corpora striata, unite before the thalami to form the origin of the corpus callosum. Previous to this period, the membranous hemispheres are so little developed, that they do not cover the thalami, but after the eleventh week they become so large, that they are gradually prolonged backwards or iniad, until they terminate by stretching over the corpora quadrigemina and the cerebellum.

From the corpora mamillaria, two narrow medullary stripes, the anterior pillars of the fornix, ascend before, or glabellad to the thalami, in a curved figure, upwards and backwards, or coronad and iniad, to these bodies, and join with their outer margins the membranous hemispheres, but remain apart on their inner or mesial margins, so as to leave a free communication between the lateral and third ventricles. The olfactory nerves are very bulky, and similar to the mamillary eminences of quadrupeds, are hollow, and communicate with the anterior cornu of the lateral ventricles. The optic and other nerves are visible.

At the fourth month, the pia mater, firm and traversed with numerous blood-vessels, covers the brain and spinal cord, and penetrates into the cavities. On the base of

the brain, the annular protuberance is now apparent, but very narrow, and consisting of transverse fibres, which cover the spinal cord, and unite in the mesial line. The olfactory nerves are seen to issue from the fissura Sylvii. The middle and posterior lobes of the cerebrum are now distinguishable by a slight furrow. The fifth pair of nerves are seen to derive their origin either from, or immediately before, the annular protuberance; the other nerves arising from their apparent external points of origin. The restiform bodies are seen to send fibres both to the cerebellum and the annular protuberance. The upper or coronal surface of the cerebrum has some furrows here and there. The thalami are now united by the posterior commissure, and the pineal gland small and flat with its peduncles are now apparent; so also is the anterior commissure.

The two anterior pillars of the fornix, after ascending near the corpus callosum, unite, and almost immediately again separate, and extend backwards or iniad in the figure of thin plates, which cover and surround the thalami, and descend to the base of the posterior lobes of the hemispheres, thus forming part of the body, the corpora fimbriata, and the posterior crura or pillars of the fornix. The Hippocampi are also observable at this period.

The medullary matter can now be distinctly traced. The medullary fibres of the medulla oblongata proceed above or corono-glabellad of the tuber annulare, give off ascending fibres to the corpora quadrigemina, mutually separate to the right and left, and penetrate into, or form the thalami; some fibres descending to the corpora mamillaria. The remaining fibres, which are very numerous, proceed under or basilad of the thalami,

forwards and outwards, or glabellad and laterad, and radiate like the branches of a fan, into the striated bodies, and into the membrane of the hemispheres, upwards, forwards, outwards, and backwards. Some are reflected inwards, or mesiad, to form the roof of the lateral ventricles, and afterwards descend to join the fornix; those of the two sides uniting anteriorly or glabellad to form the corpus callosum.

At the fifth month, there are visible, on various points of the pia mater, thin transparent patches, which are the rudiments of the tunica arachnoides. Several deep furrows and convolutions are now apparent on the mesial or inner aspect of the hemispheres where they are applied to the falx cerebri, which convolutions make corresponding elevations or folds in the interior of the lateral ventricles; but no convolutions, furrows, or folds, are found on the outer or peripheral aspect. The septum lucidum is seen arising, by two very thin plates, from the anterior pillars of the fornix, to be attached to the corpus callosum, thus leaving a free communication between the fifth and third ventricles. The fornix is now united to the posterior or inial aspect of the corpus callosum, where its two portions also join each other. A deep fissure is observable between the corpus striatum and the thalamus.

At the sixth month, the falx cerebelli is observable, and the arachnoid membrane distinct. The posterior lobes of the cerebrum now cover the corpora quadrigemina, and almost the whole cerebellum, although in the preceding month, they do not entirely cover the corpora quadrigemina. The external or lateral walls of the lateral ventricles are considerably increased in thickness, much more so than the internal or mesial; the ventricles themselves are very spacious, of an oblong form, and elevated above, or coronad to, the corpus callosum; the three

cornua are very distinct. The choroid plexus is very voluminous, and sends out vessels here and there over the cavities. The laminæ of the septum lucidum are joined so as to form the fifth ventricle, which has an aperture between the anterior crura of the fornix, near the foramen of Monro. The corpus callosum extends more backwards or iniad, but not yet sufficient to cover the thalami and third ventricle. The medullary substance forming the corpora quadrigemina is much thicker, thus rendering the iter à tertio ad quartum ventriculum considerably narrower. The optic tracts, when traced to the thalami, and the corpora quadrigemina, have now the corpus geniculatum externum, which can be raised along with the tract, in the form of a layer, from these bodies. On the basis, the tuber annulare is much broader, consisting of transverse fibres, descending from the cerebellum, and uniting on the mesial line, where the basilar artery makes a longitudinal furrow.

At the seventh month, the cerebrum is greatly increased in volume, the posterior lobes now covering and even extending beyond the cerebellum, and several furrows and convolutions are observable on the surface. The corpus callosum covers the thalami, and consists of transverse fibres passing from one hemisphere to the other; the fornix is now complete, the two sides being united by a thin plate or layer of medullary matter, which corresponds with that portion named lyra; the corpora quadrigemina are divided by a transverse line or furrow, rendering them complete and distinct, the two superior, or nates, being a degree larger than the two inferior, or testes, and their parietes so thick, that the iter à tertio ad quartum ventriculum may be said to be perfect. The cerebral nerves are very large, compared to the mass of the brain.

At the eighth month, the brain is almost perfect in its organization, the furrows and convolutions are more numerous on the anterior and middle lobes of the cerebrum, than on the posterior. When the pia mater is detached from the outer or peripheral surface of the cerebrum, a layer of soft substance adheres to this membrane; and if this be removed by immersion in water, the pia mater presents a multiplicity of flocculent processes, which are very delicate blood-vessels, that penetrate the substance of the brain.

At the ninth month; the commissura mollis is formed, and the tænia semicircularis is a soft mass, traversed by blood-vessels, beneath which runs a large vessel, that when removed, detaches also the tænia.

With respect to the cineritious and medullary substances which compose the brain, it is impossible to distinguish between them in the fetus. All the parts of which the fetal brain consists, are formed of a homogenous reddish-white substance, the tinge of which depends on the numerous delicate blood-vessels that are distributed throughout its substance. In the corpora striata, the thalami, &c., the blood-vessels are found to be more voluminous and abundant. The outer layer, which in the adult is named cineritious, is softer in the fetus than the inner or medullary.

INDEX

OF

THE LETTERS OF REFERENCE

IN

PART VIII.

THE BRAIN, SECOND AND CONCLUDING PORTION.

PLATE VIII.

A, Anterior cornu of lateral ventricle
E, Medullary matter of hemispheres of cerebrum
F, Thalamus nervi optici
G, near *w*, Corpus striatum
G, near 𝔳, Inferior longitudinal sinus
H, Pineal gland

a, Foramen commune anterius
e, Corpus bigeminum superius vel natis
f, Anterior tubercle of thalamus
i, Vena magna Galeni
k, k, Anterior pillars of fornix

a, Foramen commune posterius
d, Tentorium cerebelli
f, Corpus geniculatum internum
h, Peduncle of pineal gland
i, Choroid plexus
p, Posterior commissure
r, Posterior artery of cerebrum
t, Tænia semicircularis
v, Artery of corpus callosum
w, Corpus callosum

𝔳, Falx cerebri

IV, Fourth venous sinus

PLATE IX.

B, Cerebellum
E, Medullary matter of left hemisphere of cerebrum
F, Thalamus nervi optici
G, Corpus striatum
H, Pineal gland
I, Inferior cornu of lateral ventricle
Y, Section of cranium

a, Foramen commune anterius
e, Natis
f, Anterior tubercle of thalamus
k, k, Anterior pillars of fornix

a, Foramen commune posterius
c, Anterior commissure
e, Testis
h, Peduncle of pineal gland
i, Choroid plexus
p, Posterior commissure
r, Posterior artery of cerebrum
t, Tænia semicircularis
v, Artery of corpus callosum
w, Corpus callosum
x, Superior longitudinal sinus
y, Middle artery of cerebrum
z, Lateral sinus

𝔥, Hippocampus major

4, or IV, Fourth sinus

PLATE X.

B, Hemisphere, or lobe of cerebellum
E, Tuber annulare
F, Corpus olivare
G, Corpus pyramidale
R, Vertebral artery
Y, Section of cranium

a, Anterior lobe of cerebrum

a, Middle lobe of cerebrum
e, Posterior artery of cerebellum
i, Infundibulum
o, Anterior artery of cerebellum
q, Basilar artery
r, Posterior artery of cerebrum
s, *s*, Corpora mamillaria
t, Lateral communicant artery
u, Anterior communicant artery
v, Artery of corpus callosum
y, Middle artery of cerebrum

1, Olfactory nerve
2, Optic nerve
3, Motor oculi nerve
4, Pathetic nerve
5, Trigeminal nerve
6, Abducens nerve
7, Facial nerve
8, Auditory nerve
9, Glosso-pharyngeal nerve
10, Nervus vagus
11, Accessory nerve to nervus vagus
12, Lingual nerve

PLATE XI.

B, Transverse spinous process of sphenoid bone
C, Cavernous sinus
E, Dura mater, extended over sella turcica, to cover pituitary gland
R, Vertebral artery
Y, Section of cranium
Z, The Nose

b, Crista galli
d, Tentorium cerebelli
i, Infundibulum
k, Foramen magnum
o, Ophthalmic artery
p, Petrosal sinus
u, Inferior depressions of occipital bone
x, Superior longitudinal sinus
z, Lateral sinus

𝔟, Falx cerebri

∂, Falx cerebelli

1, Olfactory nerve
2, Optic nerve
3, Motor oculi
4, Pathetic nerve
5, Trigeminal nerve
5*, Middle meningeal artery
6, Abducens nerve
7, Facial nerve
8, Auditory nerve
9, Glosso-pharyngeal nerve
10, Nervus vagus
11, Accessory nerve to nervus vagus
12, Lingual nerve
19, Internal carotid artery

IV, Fourth sinus

PLATE XII. *Fig.* 1.

C, Spinal cord

d, Theca vertebralis

e, Ligamentum denticulatum

Fig. 2.

E, Tuber annulare
F, Corpus olivare
G, Corpus pyramidale

e, Natis

e, Testis
l, Processus cerebelli ad testes
n, Processus cerebelli ad tuber annulare
o, Processus cerebelli ad medullam oblongatam

PLATE XII. *Fig.* 2. (*Continued.*)

4, Pathetic nerve
5, Trigeminal nerve
6, Abducens nerve
7, Facial nerve
8, Auditory nerve
9, Glosso-pharyngeal nerve
10, Nervus vagus
11, Accessory nerve to nervus vagus
12, Lingual nerve

Fig. 3.

D, Corpus dentatum
E, Tuber annulare
F, Corpus olivare
G, Corpus pyramidale

Fig. 4.

B, Cerebellum
E, Tuber annulare
F, Thalamus nervi optici
G, Corpus pyramidale
G*, Corpus striatum
N, Corpus niger
e, Natis
g, Crus cerebri

e, Testis
s, Corpus mamillare

Fig. 5.

C, Spinal cord
E, Tuber annulare
F, Thalamus nervi optici
e, Testis
i, Infundibulum
s, *s*, Corpora mamillaria

a, Anterior lobe of cerebrum
e, Natis
g, Crus cerebri
1, Olfactory nerve
2, Optic nerve
2*, Optic tract

Fig. 6.

A, Occipital bone
B, Atlas
C, Dentata
D, Spinous processes of cervical vertebra
R, Vertebral artery
X, Body of vertebra

PLATE XII. *Fig.* 6. *(Continued.)*

d, Occipital artery
e, Branch of communication between vertebral and occipital artery
k, Foramen magnum

22, Second cervical nerve
23, Third cervical nerve

PLATE XIII.

B, Hemisphere of cerebellum
E, Tuber annulare
F, Corpus olivare
G, Corpus pyramidale

a, Anterior lobe of cerebrum
g, Crus cerebri

a, Middle lobe of cerebrum
i, Infundibulum

n, Processus cerebelli ad tuber annulare
o, Processus cerebelli ad medullam oblongatam
s, *s*, Corpora mamillaria

𝔄, Posterior lobe of cerebrum

1, Olfactory nerve
2, Optic nerve
2*, Optic tract

PLATE XIV.

B, Cerebellum
C, near d, Spinal cord
E, Tuber annulare
F, Thalamus nervi optici
G, Corpus pyramidale
H, Pineal gland
K, Fornix
N, Corpus niger

R, Vertebral artery
V, Valve of Vieussens

d, Theca vertebralis
e, Natis
g, Crus cerebri
i, Vena magna Galeni
k, Anterior pillar of fornix

PLATE XIV. *(Continued.)*

e, Testis
l, Processus cerebelli ad testes
m, Commissure of cerebellum
n, Processus cerebelli ad tuber annulare
o, Processus cerebelli ad medullam oblongatam
p, Posterior commissure
q, Basilar artery
r, Posterior artery of cerebrum
u, Artery of corpus callosum
w, Corpus callosum
x, Superior longitudinal sinus
z, Lateral sinus

3, Third ventricle
4, near *o* and *n*, Fourth ventricle
4, or IV, near *x* and *z*, Fourth sinus
5, Fifth ventricle
19, Internal carotid artery
- - - - -, Iter à tertio ad quartum ventriculum

PLATE XV.

A, Hemisphere of cerebrum
D, Dura mater
Y, Section of cranium

EDINBURGH:
Printed by John Brewster,
11 Society.

PART IX.

THE ORGANS OF SENSE, &c.

A SYSTEM OF ANATOMICAL PLATES,

ACCOMPANIED WITH DESCRIPTIONS,

AND

PHYSIOLOGICAL, PATHOLOGICAL, AND SURGICAL OBSERVATIONS.

BY

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PART IX.—THE ORGANS OF SENSE, &c.

EDINBURGH:
PRINTED FOR DANIEL LIZARS, 61, PRINCES STREET, EDINBURGH;
S. HIGHLEY, 174, FLEET STREET, AND WEBB STREET, MAZE POND, BOROUGH, LONDON; AND W. CURRY, JUN. & CO. 9, UPPER SACKVILLE STREET, DUBLIN.
1826.

EDINBURGH:
Printed by John Brewste
11 Society.

TO

SIR EVERARD HOME, BART.

VICE-PRESIDENT OF THE ROYAL SOCIETY; SERJEANT-SURGEON TO KING; SURGEON TO THE ROYAL HOSPITAL, CHELSEA; SENIOR SURGEON TO ST. GEORGE'S HOSPITAL; HONORARY PROFESSOR TO THE ROYAL COLLEGE OF SURGEONS, &c.

THIS PART IS INSCRIBED,

AS A MARK OF

ADMIRATION OF THOSE DISTINGUISHED TALENTS,

WHICH HAVE ELUCIDATED

THE DARK PATHS OF

THE PHYSIOLOGICAL AND PATHOLOGICAL SCIENCES,

BY HIS VERY OBEDIENT SERVANT,

THE AUTHOR.

PREFACE.

THE Author cannot allow this Part to go forth to the public, without adverting to the increasing difficulties by which the prosecution of medical studies is prevented. The community, who are sensitively alive to self-preservation on other occasions, seem blind and infatuated in this instance,—they appear to think, that as long as the evil hour is postponed, so long may they oppose the means necessary to avert the evil; nay, their minds remain obdurate till the last scene of sickness and danger presents itself. This very session, the liberal, enlightened, and truly philanthropic Public Authorities of Glasgow and Newcastle have *arrested* in their progress *subjects travelling* through their cities, as if they were Radicals carrying *death* and destruction through the country. Doubtless Baillie Jarvie hopes to signalise himself so much, that a monument equal to that of Sir John Moore, will be erected to his memory on the opposite side of George Square, Glas-

gow; and My *Lord* Mayor of Newcastle, no doubt, expects that his officious zeal will acquire him as much renown as My Lord Chief Justice in Henry the Fourth. There is not a physician or a surgeon, who can do his duty properly to his patient, or conscientiously to himself, who does not occasionally, I ought to say daily, inspect the human frame. The youngest and the oldest of the profession are appointed to hospitals, to take charge of the lives of their fellow-creatures, without having put their hand to a dead body. Let any one read the public medical journals, or investigate the reports of the hospitals, and reconcile to his feelings the fatal blunders which are daily committed both by physicians and surgeons. How many are treated for colick, and die of inflammation of the bowels? how many are treated for low nervous fever or typhus, and die of acute inflammation? how many are tortured on the operating table for stone in the bladder, or for aneurism, and die on the same or the following day, of hemorrhage, or inflammation produced by the unhallowed hands of the surgeon?

"Enter his chamber, view his breathless corpse,
"And comment then, upon his sudden death."

And whence do all these lamentable mistakes arise? Solely in consequence of physicians and surgeons having no opportunities of making themselves masters of their profession.

The next question which may naturally be asked, is, Does not the same lamentable evil exist in private practice? and the answer is as naturally, Undoubtedly it does. This very day I have operated on a gentleman from the contiguous county of England to that of the *worthy Mayor* of Newcastle, for fistula in perineo, whose urethra was destroyed by one of the medical practitioners of the county attempting to introduce the catheter about three years ago. I have been obliged to lay the urethra open from the bulb onwards to the bladder, or rather I have been compelled to make a new urethra, for every vestige of the former one was obliterated by sinuses; and I here candidly confess, that all the operations for puncturing the bladder, which I have performed (and these have not been a few), have been in consequence of practitioners injuring the urinary canal by the introduction of the catheter.

Since the publication of Part VI., the Royal College of Surgeons of Edinburgh have passed a law, enacting, that three months' dissection shall in future

be held necessary for qualifying candidates for diplomas; and the Senatus Academicus of our far-famed University, have even yet only recommended a three months' course of dissections for graduation. Since the publication of the above Part, too, the author has presented a Memorial to the Town-Council of Edinburgh, setting forth the evils which are daily accruing both to the medical school and the public, from the want of *subjects;* but his memorial, he regrets to say, has produced no favourable result; for, as the late celebrated Dr. Pitcairn said, when he was using every exertion to establish an anatomical school here, in 1694, "there is great opposition by the chief surgeons, who neither eat hay, nor suffer the oxen to eat it."* *Subjects* have now risen to the enormous sum of twenty guineas,—a sum sufficient to enable a student to go to Paris, study his profession, and return home—and have moreover become so scarce, that one Lecturer on Anatomy, who has been teaching for these four years past, has been obliged to resign; and that able and scientific lecturer, Dr. Barclay,—who has now, from the natural course of years, resigned his duties as a teacher,—has, within these some years back, been repeatedly

* Bower's History of the University of Edinburgh, vol. ii. page 149.

heard to say, that he saw no alternative except giving up teaching human, and confining himself to comparative anatomy.

EDINBURGH, 33 YORK PLACE,
24th December 1825.

CONTENTS.

Surgical Observations.

THE MUSCLES

OF

THE HEAD AND NECK.

IN dissection, I would recommend it to the student to begin with the muscles of the face, as they spoil much more quickly than those of the neck. The latter, however, I shall describe first, as I intend next to advance to the muscles of the face, and then proceed to those of the organs of sense.

In Part IV. several of the muscles of the back of the neck are described, so that only those on the anterior or sternal aspect of this part require to be detailed. When the integuments are dissected off on the lateral aspect of the neck, a delicate expanse of muscular fibres presents itself, as displayed in Plate X. of Part II., marked F, which is named the platysma myoides.* To display this muscle, an incision should be cautiously made through the skin and cellular substance, parallel with its fibres, from over the centre of the base of the inferior maxilla, to the middle of the clavicle A, and the in-

* Syn. Est alterius lateris primus musculus, eorum qui buccas et labra movent: Musculus latus in collo positus: πλατυσμα μυωδις: Quinti paris maxillæ: Musculus auriculæ et utrique labro communis: Musculus latus: Detrahens quadratus, communis buccarum labiorumque: Quadratus genæ, seu tetragonus: Quad-

teguments reflected to each side. The muscle will then be observed to be attached nearly to the whole extent of the clavicle A, and to the cellular web enveloping the pectoralis major and deltoid muscles; also to the base of the inferior maxilla and the cellular envelope of the parotid gland s, and that of the masseter muscle l, the anterior or glabellar fibres mingling with those of the depressor anguli oris b. The attachment to the clavicle is considered the origin of this muscle. The function of this muscle is chiefly to corrugate the skin of the neck, with which it is intimately connected, and to assist the cutaneous venous circulation.* It also assists the depressor anguli oris in depressing the angle of the mouth, and in drawing the skin of the cheek downwards; has some effect in depressing the head laterally, and the inferior maxilla downwards, or sternad; likewise in rotating the head on the vertebra dentata; and when the head is fixed, in elevating the skin and even the trunk. In physiognomy,

ratus genæ, vel latissimus colli: Platisma myodes· Le péaucier: Pars ex mala nascens, est risorius novus: Pars ad auriculam pertinens est portio musculi cutanei supra parotidem ad aurem adscendentis: Adducens ad anteriora: Sunt fibræ carneæ a musculo quadrato colli ad partem auriculæ inferiorem dilatæ: The common proceeding from the quadratus genæ: Musculus cutaneus: Le thoraco-facial: Thoraco-maxilli-facial.

* The platysma myoides is concerned in opening the external jugular vein D, in Plate IX. of Part II.; in the securing of the common carotid artery; in the extirpation of diseased lymphatic glands of the neck; in the extirpation of diseased submaxillary gland; and in the various other surgical operations of the neck. The manner of performing the first of these operations is described in page 49, and the second at page 40 of Part II. When the submaxillary or the lymphatic glands in this region are diseased, the platysma myoides so binds them down, that the magnitude of the tumour cannot be ascertained until the operation is begun, on which account the operator is frequently deceived: in all such cases, a free incision through this muscle is requisite, and the operator should dissect from the sterno-cleido-mastoideus muscle, towards the symphisis menti and trachea, keeping the edge of the scalpel to the tumour, and the back to the carotid artery and internal jugular vein.

this muscle assists in the expression of seriousness or gravity, and when violently thrown into action, in performing various grimaces.

A bold elegant muscle, named the sterno-cleido-mastoideus,* marked E, in Plate IX. of Part II., and situated beneath the platysma myoides F, extends obliquely along the side of the neck, derives a tendinous and fleshy origin from the upper or atlantal margin of the sternum, and the sternal third of the clavicle A, and ascends with parallel muscular fibres, to be inserted tendinous in the mastoid process of the temporal bone, and in the ridge extending backwards or iniad, to meet the superior transverse ridge of the occipital bone. The origin of this muscle from the clavicle occasionally occupies more of this bone than the third; and the insertion is sometimes blended with that of the trapezius 80.

The sterno-cleido-mastoideus inflects the head obliquely laterad, and forwards or sternad; when both muscles act, they inflect it directly forwards or sternad; and when this is the fixed point, they assist in approximating the trunk to the head.†

In the mesial line of the neck, beneath the integuments and the platysma-myoides, two slender muscles, having

* Syn. Musculi a pectoris osse et clavicula in caput inserti, pars ex pectoris osse pronata: Pars eadem septimi caput moventis: Eadem septimi paris, eorum qui caput movent: Eadem mastoidei, seu mastoidæi: Eadem ejus, qui le sterno-mastoidien, ou mastoïdien exterieur ou anterieur: Cleido-mastoïdeus: Sterno-mastoideus: Sterno-cleido-mastoideus: Sterno-cleido-mastoidien: Sterno et cleido-mastoideus: Sterno-clavio-mastoïdien.

† The sterno-cleido-mastoideus is concerned in securing the arteria innominata, (see Part II. p. 38); in securing the common carotid artery, (see Part II. p. 40); in securing the subclavian artery, (see Part II. p. 71); in extirpating the thyroid gland, in the extraction of tumours in the region of the neck, (see Part II. p. 41); and in wry-neck it is proposed to divide this muscle, but as the antagonist muscles are ever ready to take advantage of their opponents, this mode of practice appears very objectionable. Cases, however, are on record, where the

parallel fibres, are situated, which are named the sterno-hyoidei.* They are marked c, c, in Plate IX. of Part II., and Plate I. of Part IX. The sterno-hyoideus derives its origin from the upper or atlantal margin of the first bone of the sternum, from a small portion of the clavicle and first rib in its contiguity, and ascends in conjunction with its fellow to be inserted in the inferior or sacral aspect of the body of the os hyoides x. This muscle depresses the os hyoides to one side; and through the medium of this bone, by keeping it fixed, the sterno-hyoideus contributes to depress the inferior maxillary bone, thus assisting in opening the mouth, and in a similar manner assisting in deglutition. When the inferior maxillary bone and the os hyoides become the fixed points, the sterno-hyoideus aids in elevating the trunk towards the head.†

division of this muscle has cured the disease. Sometimes only a portion of the muscle is rigid, as, for example, the clavicular attachment, and then a division of it might be made by cutting carefully the origin of the fibres from the clavicle, keeping in view the anterior external jugular, and the subclavian veins. If the operator deems it necessary to divide the whole of the muscle, this may be done either at the origin or insertion, with more ease and less danger, however, at the latter than at the former. Should he prefer the origin, he has only to continue the preceding operation, and divide the sternal attachment, keeping close upon the bone. If he prefer the insertion, a transverse division must be made close upon the bone, and if the operator proceed carefully, he will injure no important objects. When this muscle has been divided, the chin or head-stay should be used to prevent a re-union of the muscle to the same extent as formerly. The objects which are liable to be wounded will be best understood by comparing Plates VII. VIII. IX. and X. of Part II. Either of these modes will be found preferable to and safer than that adopted by Sharp or B. Bell. This affection has also been cured by electricity.

* Ossi υ referenti propriorum alterius lateris primus: Primus hyoides: Primi paris hyoidis ossis: Primi paris ossi hyoidi, ad linguæ motum destinatorum: Secundi paris ossis hyoidis: Sterno-hyoidæus: Secundi paris, detrahentis, sterno-hyoidei: Sterno-hyoides: Le sterno-hyoïdien, ou sterno-cleido-hyoïdien.

† The sterno-hyoideus is concerned in performing laryngotomy and tracheotomy, in extirpation of the thyroid gland, in securing the common carotid artery

The sterno-thyroidei* B, in Plate VIII. of Part II., and in Plate I. of Part IX., are situated immediately beneath, or centrad to the sterno-hyoidei; they therefore occupy the same region of the neck. This pair of muscles are broader and shorter than the sterno-hyoidei; they derive their origin from the atlantal margin of the first bone of the sternum, and from the first rib, ascend with parallel fleshy fibres, and are inserted into the lower or sacral margin of the thyroid cartilage. The sterno-thyroidei assist in depressing the larynx, and when only one muscle acts, it depresses the larynx laterally. They indirectly depress the inferior maxillary bone, and indirectly aid in deglutition.†

Continuous with the fibres of the sterno-thyroideus, there is a short muscle extending between the thyroid cartilage and the os hyoides, which appears to be a continuation of the sterno-thyroideus, and is named the thyro-hyoideus.‡ It derives its origin from the sacral margin of the thyroid cartilage, where the sterno-thyroideus is inserted, and ascends with parallel fibres to be inserted in the cornu of the os hyoides. The action of this muscle is to approximate the os hyoides and thyroid cartilage in the various motions of the larynx.§

near its commencement, and in securing the arteria innominata, (see Part II., pages 38 and 40.)

* Syn. Communium laryngis musculorum tertius et quartus: Primus communis laryngis: Secundi paris communium laryngis musculorum: Primi paris communium laryngis: Bronchius: Primi paris extendentium thyroidem, vulgo bronchii dicti, at nobis sterno-thyroidei: Sterno-thyroides: Le sterno-thyroïdien.

† The sterno-thyroidei are concerned in tracheotomy, in extirpation of the thyroid gland, in securing the common carotid artery near its commencement, and in securing the arteria innominata, (see Part II. pages 38 and 40.)

‡ Syn. Communium laryngis primus et secundus: Secundus communium laryngis: Hyothyroïdeus: Hyothyroïdes: Hyo-thyroïdien.

§ The thyro-hyoideus is concerned in laryngotomy.

The omo-hyoideus* marked U, in Plate IX. of Part II., and in Plate V. of Part IV., situated in the lateral region of the neck, beneath or centrad of the sterno-cleido-mastoideus E, and parallel for some extent with the sterno-hyoideus C, is a delicate muscle, which derives its origin from the superior costa, and from the proper posterior ligament of the scapula. The slender muscular fibres ascend obliquely forwards, running beneath the trapezius 80, the clavicle A, and the sterno-cleido-mastoideus E, until they advance to the middle of the sterno-hyoideus C, to which they adhere, and ascend on its outer margin, to the body of the os hyoides X, in which they are inserted.† Where the muscle passes beneath the sterno-cleido-mastoideus, it is tendinous from the friction at this part. The muscle is therefore digastric. The function of the omo-hyoideus is chiefly to operate on the larynx, depressing the os hyoides laterally and dorsad when one muscle acts, and directly sacrad when both muscles are in action. This muscle also assists indirectly in deglutition, and in depressing indirectly the inferior maxillary bone. When the os hyoides is a fixed point, this muscle assists in elevating the scapula atlantad and sternad.

The crico-thyroideus‡ is a small arrangement of muscular fibres, represented in Plate VI. of Part II., and

* Syn. Est septimus et octavus propriorum ossis υ referenti: Quartus hyoidis: Quarti paris hyoidis: Quarti paris, ossi hyoidi, ad linguæ motum destinatorum: Quarti paris ossis hyoidis: Coraco-hyoideus: Paris quarti, oblique deorsum trahentis, coraco-hyoïdei appellati: Coraco-hyoides: Coraco, seu costo-hyoides: L'omoplat-hyoïdien, communément coraco-hyoïdien: Omo-hyoïdien: Scapulo-hyoïdien.

† The omo-hyoideus is concerned in securing the carotid artery, (see Part II. p. 40), and in securing the subclavian artery, (see Part II. p. 71.)

‡ Syn. Quartus propriorum laryngis: Primus musculorum propriorum laryngis: Ex propriis laryngis musculus anterior exteriorque: Crico-thryoïdeus anticus: Crico-thyroïdes: Crico-thyreoïdeus: Dilatateur antérieur.

in Plate I. of Part IX., marked a, situated beneath the sterno-thyroideus, and, as its name indicates, extends between the cricoid and thyroid cartilages. The fibres derive their origin from the base of the cricoid cartilage, and run obliquely backwards, to be inserted in the sacral margin of the thyroid cartilage. The two muscles nearly meet anteriorly at their origin, and separate wider and wider in their progress backwards, towards the thyroid cartilage, leaving a triangular space where laryngotomy is performed.* This pair of muscles operate on these cartilages of the larynx, approximating the one to the other in the various motions of this organ.

I shall now proceed to the description of those muscles which extend between the inferior maxilla and the os hyoides.

Immediately beneath the integuments between the inferior maxilla and the os hyoides, two muscles are seen nearly uniting with each other; these are the anterior bellies of the digastric† muscles, and are marked *w*, in Plate IX. of Part II., and in Plate I. of Part IX. Each anterior belly, or head *w*, is attached to the base of the inferior maxilla 25, where it unites with the opposite muscle, and is considered its insertion. From this point, the muscular fibres converging descend obliquely backwards, to the side of the body of the os hyoides, where they become tendinous, and adhere to that bone, or are bound to it by ligament; whence the fibres again ascend obliquely upwards and backwards, run generally

* The crico-thyroidei are concerned in performing laryngotomy.

† Syn. Alterius lateris maxillam moventium quartus: Maxillæ inferioris quartus os aperiens: Quarti maxillæ paris: Alterius paris maxillæ deprimentis biventris: Paris digastrici, sive biventris: Digastricus seu biventer: Biventer maxillæ: Mastoido-génien: Mastoïdo-hygénien.

through the delicate muscular fibres of the stylo-hyoideus G, soon become fleshy, W, and proceed in their course to the rut in the temporal bone, where they are attached, (see Part I. Plate V. *Fig.* 7, letter b,) and covered by the sterno-cleido-mastoideus E.* This latter part of attachment is considered its origin, and from this to the os hyoides is named the posterior head, or belly. Sometimes fleshy fibres arise from the os hyoides and join the anterior tendinous ones. The digastric muscle depresses the inferior maxilla, and raises the larynx and pharynx in the action of deglutition.

The mylo-hyoideus† muscle *m*, in Plates VIII. and IX. of Part II., and in Plate I. of Part IX., situated beneath or centrad of the anterior belly *w* of the digastric muscle, may be considered as one muscle, as adopted by Chaussier, instead of a pair of muscles, as it is a broad fan-like arrangement of muscular fibres, descending from the inferior maxilla to the os hyoides. As a pair, each is described as deriving its origin from a ridge on the interior or central surface of the inferior maxilla, (see Part I. Plate VI. *Fig.* 26, letter *p*,) between the last dens molaris and the symphysis menti; the muscular fibres descend forwards in a converging manner, unite with those of the opposite side, and are inserted into the convex portion of the body of the os hyoides x.‡ The function of the mylo-

* The digastric muscle may become concerned in the extirpation of diseased lymphatic glands at the angle of the inferior maxilla. The operator should remember, that the branches of the external carotid artery, with the exception of the greater portion of the facial, are beneath or centrad to this muscle.

† Syn. Secundi paris ossi υ referenti propriorum: Secundi paris hyoidis ossis: Secundi paris ossi hyoidi, ad linguæ motum destinatorum: Primi paris ossis hyoidis: Milo-hyoideus: Primi paris, recta attollentis, genio-hyoidei: Milo-hyoides: Le mylo-hyoïdien.

‡ The mylo-hyoideus muscle relates only to that masterly operation, the removal of the inferior maxillary bone, (see page 125 of Part I.)

hyoideus is to elevate the os hyoides in the action of deglutition, and to depress the inferior maxilla in opening the mouth.

When the mylo-hyoideus is carefully detached at its origin from the inferior maxillary bone, and reflected downwards to its insertion, a pair of short muscles are brought into view, the genio-hyoidei,* marked *l*, in Plate VII. of Part II., and in Plate II. of Part IX. They are so close together, that it requires some pains to separate them. They arise tendinous from a small ridge on the internal or central surface of the inferior maxillary bone, forming part of the symphysis menti, (see Part I. Plate VI. *Fig.* 26, ridge between *n* and *m*; Description, page 61), and descend to be inserted fleshy into the centre of the body of the os hyoides. The genio-hyoidei depress the inferior maxilla, so as to open the mouth, and elevate the larynx and pharynx in deglutition.†

When the genio-hyoidei are neatly insulated, and divided across, there appear a pair of muscles precisely similar, but which, on more minute inspection in the lateral aspect, are observed to radiate towards the tongue, and are therefore named genio-hyo-glossi.‡ They are marked with the letters *k*, in Plate VII. of Part II., and in Plates II. and III., *Figs.* 1, of Part IX. They derive their origin from two small elevations on the internal or central surface of the inferior maxillary bone, on each side of the

* Syn. Quinti paris hyoidis ossis: Quinti paris ossi hyoidi, ad linguæ motum destinatorum: Le genio-hyoïdien.

† The genio-hyoideus is concerned in removal of the inferior maxillary bone, (see Part I. p. 125.)

‡ Syn. Nonus linguæ: Quartus linguæ: Quintus linguæ: Primum par linguæ: Genio-glossus.

symphysis menti, (see Part I. Plate VI. *Fig.* 26, letters *n, n,*) descend in a radiating form, to be inserted in the base of the os hyoides, and the tip, middle, and root of the tongue; the latter bundle of fibres intermingling with those of the stylo-glossus and lingualis muscles. The function of this muscle, from the radiation of its fibres, is very varied and extensive; it pushes the tongue to the palate, and out of the mouth, retracts it, moves it from side to side, draws the tip downwards in the mouth, and renders its dorsum convex or concave. The fibres extending to the os hyoides depress the inferior maxilla, or elevate the larynx and pharynx in deglutition.*

Before proceeding with the other muscles of the tongue, the three styloid muscles should be examined; indeed, it would have been preferable to display the stylo-hyoideus immediately after the digastric, as it obstructs, in some degree, the student in examining the mylo-hyoideus. The stylo-hyoideus† muscle G, in Plate I. of Part IX., accompanies the posterior head W of the digastric muscle, by which it is often perforated, and, as its name indicates, it extends between the styloid process and the os hyoides. It derives a tendinous and fleshy origin from the middle and inferior part of the styloid process of the temporal bone, soon becomes fleshy, and descends to be inserted in the side of the os hyoides. The precise origin of this muscle is better seen in Plate II. of Part IX. Near its insertion it is generally pierced with the posterior head W of the digastric muscle. The function of the stylo-hyoideus

* The genio-hyo-glossus is concerned in extirpation of the tongue, and in removal of the inferior maxillary bone.

† Syn. Tertii paris ossi υ referenti propriorum: Stylo-ceratoïdes: Stylo-cerato-hyoideus: Stylo-hyoïdes major.

is to elevate the os hyoides, and through it the larynx and pharynx, in deglutition.*

A small slender slip is sometimes found descending to the cornu of the os hyoides, which, when present, is named stylo-hyoideus alter.

A delicate ligamentous slip *s*, generally extends from the styloid process *q*, of the temporal bone, to the angle *d*, of the inferior maxillary bone, as represented in Plate I. of Part IX. This ligamentous slip commonly arises in conjunction with the stylo-hyoideus G, from the styloid process. Another ligamentous slip, still more delicate, frequently extends from the styloid process, to the cornu of the os hyoides.

When the posterior belly of the digastric muscle, and the stylo-hyoideus, are removed, the other two styloid muscles are brought into view, viz. the stylo-glossus m, and the stylo-pharyngeus k, both of which are delineated in Plate VIII. of Part II., and in Plate II. of Part IX. The stylo-glossus muscle† m, the situation of which is indicated by its name, derives a tendinous and fleshy origin from the styloid process *q*, and the ligamentous slip *s*, extending to the inferior maxillary bone, and descends obliquely forwards to the root of the tongue, where its fleshy fibres spread, extending onwards along the side nearly to the apex or tip, blending or intermingling with the fibres of the lingualis and the genio-hyo-glossus muscles. The function of the stylo-glossus muscle is to pull the tongue upwards, laterally, and backwards, or coronad, laterad,

* In operating at the angle of the jaw-bone, the surgeon should be aware that the stylo-hyoideus muscle lies superficially to the branches of the external carotid artery, with the exception of the continuation of the facial branch.

† Syn. Quintus et sextus linguæ musculorum: Tertii paris linguæ musculorum: Tertii paris propriorum linguæ: Secundi paris linguæ: Sexti paris, oblique trahentis, stylo-glossi.

and iniad; by this means approximating the root of the tongue to the fauces, so as to diminish the isthmus faucium, and therefore concerned in deglutition. By pulling the root of the tongue upwards and backwards, it overhangs the glottis, and prevents the bolus of food getting into the larynx. When one muscle acts, it moves the tongue dextrad or sinistrad. They must also have the power of pushing the tongue upwards and forwards towards the roof of the mouth, as is exemplified in other muscles of the tongue, viz. the genio-hyo-glossi; and must, therefore, be concerned in speech.*

The situation of the stylo-pharyngeus† k, is indicated by its name. This muscle derives a fleshy origin from the styloid process of the temporal bone, and descends obliquely downwards; its fibres blend with those of the inferior constrictor of the pharynx, and some are capable of being traced downwards to the thyroid cartilage. The function of this muscle is to dilate or compress the pharynx, and to elevate both it and the larynx, upwards and backwards in deglutition.

When these styloid muscles have been removed, the deeper seated muscles of the tongue may be examined. The hyo-glossus‡ muscle, marked *i*, in Plates VII. and VIII. of Part II., and in Plate I. of Part IX., derives its fleshy origin from the cornu of the os hyoides x, and ascends with a broad arrangement of parallel fibres, to the side of the root of the tongue, where they intermingle with those

* The stylo-glossus is only concerned in extirpation of the tongue, when cancerous.

† Syn. Quarti paris linguæ, quod et faucibus adscribi potest: Tertii paris faucium, stylo-pharyngei: Stylo-pharyngæus.

‡ Syn. Pars tertii et quarti linguæ musculorum: Secundum par linguæ: Tertium par linguæ musculorum: Basio-glossus: Quintum par deprimens, sive cerato-glossus: Cerato-glossus, Basio-glossus et Chondro-glossus: Hio-glossus: Hyo-glossi: Hio-chondro-glossi.

of the genio-hyo-glossus, the stylo-glossus, and the lingualis muscles. The function of this muscle is to elevate or depress the root of the tongue, and also to expand its breadth, wherefore it is concerned in speech and deglutition.

The lingualis muscle,* marked 60, in Plate VII. of Part II., is partly obscured by the insertions of the hyo-glossus *i*, and the genio-hyo-glossus *k* muscles, between which some of the fibres of the lingualis are seen. It arises by scattered fibres from the side of the root of the tongue, advances onwards more or less blended with the fibres of the stylo-glossus muscle, and is lost in scattered fibres at the apex or tip of the tongue. The function of this muscle is to direct the tongue upwards, downwards, laterally, forwards, and backwards; hence it is employed in speech and deglutition.

Besides the fibres of the lingualis, there are a number of muscular fibres distributed throughout the tongue, as will be represented in sections of that organ. These are arranged longitudinally,† transversely,‡ and perpendicularly,§ and multiply the motions of the tongue to a great extent. In their individual strata they contract or relax that portion of the tongue wherein they are situated.

In a regular order of dissection, the muscles of the pharynx should follow those of the tongue. There are three constrictor muscles described by the majority of authors, but these are in reality but one. They are delineated in Plates I. and II. of Part IX., the inferior being marked Y, the middle F, and the superior *y*. The inferior is only separated from the medius, and the medius from

* Syn. Les fibres longitudinales.
† Syn. Fibræ longitudinales.
‡ Syn. Fibræ transversales.
§ Syn. Fibræ perpendiculares.

the superior, at their origins, all of them being blended in their course and insertions. The constrictor pharyngis inferior Y,* derives a fleshy origin from the sides of the cricoid and thyroid cartilages; the inferior fibres proceed directly across, and the superior obliquely upwards around the mucous bag of the pharynx, where they unite with the muscular fibres of the opposite side, forming a delicate white line.† The constrictor pharyngis medius‡ F, derives a fleshy origin from the cornu of the os hyoides X, and from the root of the tongue, and the fibres proceed obliquely upwards, uniting, as they advance, with those of the opposite side, to be inserted into the cuneiform process of the occipital bone, anterior or glabellad

* Syn. Thyro-pharyngeus et crico-pharyngeus: Pars œsophagæi seu sphincteris gulæ: Thyro et crico-pharyngien: Le constricteur inférieur du pharynx: Portion du stylo-pharyngien: Crico-thyro-pharyngien.

† Where the inferior constrictor Y surrounds the œsophagus, or joins the œsophagus I, there is a diminution of the calibre or a constriction of the continued tube of the pharynx and œsophagus, which is best understood by inserting the finger from the pharynx into the œsophagus. This constriction is the point where foreign bodies, as cartilage, when swallowed, are arrested in their progress to the stomach. In such an event, the probang of every contrivance should be first employed, but if ineffectual, an incision ought to be made on that side of the neck where the body projects most, (if one side is not more prominent than another, the right should be preferred), parallel with the tracheal margin of the sterno-cleido-mastoideus, through the integuments and platysma myoides muscle, avoiding the external and the internal jugular veins, the common carotid artery, and the nervus vagus. The knife should be lateralized with the edge towards the trachea. These important objects should be held aside to the dorsal aspect, when the prominent object will appear, which should then be liberated by an incision through the constrictor muscle and mucous membrane of the pharynx. The external wound is to be brought together by adhesive plaster, and a bandage or handkerchief slightly applied. The patient to be kept extremely quiet, on low diet, nothing but milk or water for some days, which should be introduced into the stomach by an elastic tube.

‡ Syn. Hyo-pharyngeus: Pars œsophagæi seu sphyncteris gulæ: Hyo-pharyngien: Le constricteur moyen du pharynx: Portion du stylo-pharyngien: Hyo-glosso-basi-pharyngien.

to the foramen magnum. The constrictor pharyngis superior* *y*, arises from the inferior and superior maxillary bones, near the dentes sapientiæ; between these from the root of the tongue, the palate, and the buccinator muscle; from the pterygoid muscles, particularly the internal; and from the cuneiform process of the occipital bone, near the anterior condyloid foramina. The fibres proceed almost directly across, to unite with those of the opposite side. The points of origin of the superior constrictor are more delicate than those of either the medius or inferior, the superior is overlapped by the medius, while the medius in its turn is overlapped by the inferior constrictor; and the three muscles constitute the chief strength of the bag of the pharynx. This pouch, as delineated in Plates I. II. III. IV. and V. *Figs.* 1, is a muscular and mucous membranous sac, extending from the basis of the skull, or the cuneiform process of the occipital bone, to the œsophagus I, or to the sacral margin of the cricoid cartilage N; and bounded posteriorly or dorsad by the cervical vertebræ, and anteriorly or glabellad by the posterior apertures of the nares T, T, Plates III. IV. and V. *Figs.* 1, the velum pendulum palati F, Plates III. IV. and V. *Figs.* 1, the arches of the fauces 1, 2, the root of the tongue G, the epiglottis Q, Plates III. IV. and V., and the arytenoid, the thyroid, and cricoid cartilages.

The pharynx is widest behind the nares, which portion is named the arch; it then contracts a little on each side, and again expands behind the epiglottis, which latter por-

* Syn. Milo-pharyngæus, glosso-pharyngæus, pterygo-pharyngæus: Mylo-glosse glosso-pharyngien, pterygo-pharyngien, génio-pharyngien: Pars œsophagæi seu sphincteris gulæ: Le constricteur supérieur du pharynx: Portion du stylo-pharyngien: Ptérigo-syndesmo-staphili-pharyngien.

tion is termed the body; and lastly it contracts, where it terminates in or becomes the œsophagus, which portion is styled the sphincter. At the arch, or immediately behind the posterior apertures of the nares, the Eustachian tubes terminate, as delineated in *Fig.* 2 of Plate V. letter z; and in this neighbourhood there are several longitudinal rugæ. There are also rugæ behind the larynx.

Besides the mucous and muscular structures, the muscular is surrounded by a cellular expanse, which is troublesome to dissect off, in order to display the former.

I shall here continue the description of the pharynx, although it would probably be more systematic to describe it along with the organs of mastication, deglutition, and digestion. In Plate II., and *Fig.* 1 of Plate V., the pharynx is seen lined with a soft mucous membrane, marked b, resembling velvet, which is a continuation of that of the nares and mouth; and in Plates III. and IV., this membrane is observed to be studded with a multiplicity of small glands of the conglobate kind, named pharyngeal. These glands secrete the greater portion of the mucous fluid, which lubricates this surface in deglutition and respiration. The termination of the capillary arteries here is into secreting points, which contribute also to supply the mucous fluid.

After the investigation of the pharynx and its muscles, the dissector should proceed to the muscles of the soft palate; but the muscles attached to the inferior maxillary bone require to be previously examined, and, as formerly mentioned, those of the face should precede the latter. Keeping this natural order in view, I shall proceed to the muscles of the velum pendulum palati, previously describing the velum itself. This curtain,* marked F, in *Figs.* 1

* Syn. Valvula palati.

of Plates III. IV. and V. of Part IX., consisting of a number of muscles and glands, invested with a mucous membrane, hangs elegantly down in the back part of the mouth, from the posterior or inial free margin of the palate bones (see Part I. Plate IV. *Fig.* 2, digits 22), and terminates in a central pendulous point, named the uvula, or pap of the throat, which is marked *f*, and which forms the central apex, or junction, of four arches,* marked with the digits 1, 2, or what is named in architecture, the central point of a groined arch; their lower extremities resting on, or arising from the root of the tongue, and the sides of the body of the pharynx. The digits 1 indicate the two anterior, which arise from the root of the tongue; and the digits 2 the posterior arches of the fauces, which arise from the sides of the body of the pharynx. The space bounded by these arches and the uvula is named the fauces. The glandular object, situated on each side between two of these arches, marked 3, is termed the tonsil, amygdala, or almond. This glandular tissue has a number of lacunæ opening towards the fauces, as represented in *Fig.* 1 of Plate V., is of a reddish colour, and has some resemblance to the exterior of the shell of the almond, and is classed under the conglobate glands. The mucous glands of the velum are distinctly represented in *Fig.* 1 of Plate IV. Both these and the amygdalæ secrete mucus, to lubricate these surfaces in deglutition and speech.†

* Syn. Columnæ septi palati.

† The amygdalæ, or tonsils, are subject to inflammation, which, when it assumes the phlegmonous type, constitutes cynanche tonsillaris, being circumscribed, of a deep-red or purple colour, and greatly swollen. The tumefaction is sometimes so great, that when both tonsils are inflamed, they approximate and prevent deglutition, chiefly, however, by impeding the action of the muscles. The treatment is

The muscles operating on the velum palati, are the constrictor isthmi faucium, the palato-pharyngeus, circum-

by the application of the vapour of water through the medium of a tube, or what is termed a *douche*, to the tonsils; leeches to the neck, poultices around the exterior of the throat; and if the inflammation be severe, the external jugular, or one of the veins of the arm should be opened, for the practitioner should be apprehensive of the inflammatory action, even although phlegmonous, spreading downwards, along the velum to the pharynx and larynx. Brisk cathartics should be given, the feet immersed in hot water twice or thrice a-day, and low diet with rest enjoined. Blisters are often found very efficacious after leeches and the lancet; and whenever suppuration appears established, the tonsil should be lanced carrying the instrument from the side of the throat to the mesial line.

The tonsils and velum are equally subject to erysipelatous inflammation, in which case there is little or no tumefaction, but only a rose-coloured inflammation, with one or more whitish-coloured ulcers, resembling aphthæ more than ulceration. The ulceration, however, is generally deep and extensive, occurring in patches. This affection is much more liable to spread downwards to the larynx, than the former, or phlegmonous, and is then indicated by acute pain in swallowing, with a sort of convulsive action. The patient seems horrified when the saliva or any thing induces him to swallow. I have known patients fall victims to this affection, before the practitioner appeared in the least degree aware of the danger; and on dissection, I have found the cellular substance around and between the sterno-hyoideus, sterno-thyroideus, and other muscles in contiguity, infiltrated with purulent matter; also the glottis, the epiglottis, the tonsils, and the velum. The treatment requires to be much more active than in the preceding, particularly in the use of the lancet. This erysipelatous affection is what occurs in scarlatina, and is then named cynanche maligna. The inflammation sometimes ends in mortification. Cynanche pharyngæa is characterised by nearly the same symptoms, requires the same treatment, and is seldom an idiopathic affection, but supervenes one of the preceding. The tonsils are very subject to be attacked with ulceration in secondary syphilis. They are also occasionally attacked with a chronic inflammation, which tumefies them to so considerable a magnitude, as to impair the voice and deglutition; and it has been proposed to remove them by ligature, cautery, or the knife. The ligature, from the irritation it produces, is inadmissible; the cautery may be occasionally employed to advantage; but the knife is the best remedy. The mouth of the patient is to be held open by a piece of wood placed between the teeth, and the tongue kept down by a spatula, when the operator transfixes the enlarged tonsil from behind forwards with a curved needle, armed with a large flat ligature, and mounted on a

flexus or tensor palati, and the levator palati, of each side, with the azygos uvulæ in the centre.

The constrictor isthmi faucium,* marked with the digit 1, in *Fig.* 1 of Plate IV., is situated at the back part of the mouth, forming the chief portion of the anterior arch of the fauces, deriving its origin from the side of the root of the tongue, and ascending with delicate fibres, which are lost in the velum palati, near the uvula. This delicate muscle is covered by the mucous membrane of the mouth and velum, and its carneous fibres are distinctly seen through this membrane, indeed fully more distinctly than when removed. The use of this muscle is to contract the fauces in deglutition, by bringing the velum to the tongue, and elevating the tongue to the former.†

The circumflexus palati,‡ marked a, in *Fig.* 1 of Plates III. and IV., situated at the posterior aperture of the nares, and base of the cranium, extending along the mesial aspect of the internal pterygoid muscle, arises by delicate scattered fibres from the spinous process of the sphenoid bone, and around the cartilaginous portion of the Eustachian tube, descends obliquely outwards, along the

stick; with this ligature he is enabled to pull forwards the tonsil with his left hand, and to dissect out the tonsil, by first making a circular incision near its root through the mucous membrane, and then gradually cutting from above downwards, until the mass is extirpated. Gargles of the diluted mineral acids, or of a solution of sulphate of zinc, should be used to suppress any bleeding if troublesome; but if alarming, a piece of dry sponge, having a ligature through it, should be held on the part with the fingers, or the actual cautery applied.

* Syn. Glosso-staphylinus: Glosso-staphylinus seu glosso-palatinus.

† This muscle is concerned in the operation of staphyloraphy, or velu-synthesis.

‡ Syn. Primum par musculorum qui faucibus dilatandis aut constringendis inserviunt: Pterystaphilinus externus: Pterygo-staphilinus externus: Pterigo-palatinus, seu spheno-pterigo-palatinus, seu pterigo-staphylinus: Palato salpingæus: Pterigo-palatinus: Spheno-salpingo-staphylin: Le péristaphylin externe ou inférieur: Pterygo-staphylin.

mesial aspect of the internal pterygoid muscle n, and runs round the unciform process *l* of the sphenoid bone, in the form of an elegant round tendon, which expands in a broad tendinous web, forming the chief strength of the velum palati; the tendon of the one muscle uniting with that of the other, and with some of the other muscles of the velum, as the palato-pharyngeus. The function of this muscle is to stretch the velum, and to elevate it towards the posterior apertures of the nares, so as to prevent solids or fluids ascending in the act of deglutition.*

The levator palati† muscle, marked L, in *Figs.* 1 of Plates III. and IV., situated at the back part, or inial aspect of the velum palati, immediately below or sacrad to the circumflexus palati, is a much bolder muscle than the circumflexus, and separated from it by a small quantity of soft adipose substance; it derives its origin from the exterior of the osseous and cartilaginous portions of the Eustachian tube, and descends obliquely forwards to the velum, where its fleshy fibres spread so as to unite with those of the opposite side, and some of the other muscles implanted in the velum. The function of this muscle is to elevate the velum upwards and backwards, so as to shut up the posterior apertures of the nares in deglutition.‡

* The circumflexus palati muscle is concerned in velu-synthesis, or staphyloraphy.

† Syn. Secundum par musculorum, qui faucibus dilatandis aut constringendis inserviunt: Pterystaphylinus internus: Par internum gargareonis: Pterygo-staphylinus internus: Sphæno-palatinus: Salpingo-staphylinus: Columellæ musculus, in triangularem expansionem deorsum productus, seu spheno-palatinus: Levator palati mollis: Petro-salpingo-staphylin, ou salpingo-staphylin interne: Petro-staphylin.

‡ The levator palati muscle is concerned in staphyloraphy, or velu-synthesis.

In the centre of the uvula, a small round muscle, named azygos uvulæ* is situated, and which is displayed by making a perpendicular incision from the longitudinal palatine suture to the apex of the uvula, either on the anterior or posterior aspect of the velum. This muscle, marked *u*, in *Fig.* 1 of Plate IV., derives its origin from the small projecting point formed by the junction of the palatine plates of the palate bones, and descends perpendicularly along the velum and uvula to the apex or tip of the latter. This muscle assists the circumflexus and levator in elevating the velum and uvula, so as to shut up the posterior apertures of the nares in deglutition.†

The palato-pharyngeus muscle,‡ marked D, in *Fig.* 1 of Plate III., situated in the side of the palate and pharynx, requires to have the fibres of the superior constrictor of the pharynx *y* removed, in order to bring it into view, and is then observed to consist of muscular fibres, extending between the velum palati and the pharynx, which neither arise nor terminate at any definite point. It forms the posterior arch of the fauces. The origin of this muscle is blended with the tendinous expanse of the circumflexus palati, and the fibres in their descent mingle with those of the stylo-pharyngeus k, some of them being ultimately inserted in the thyroid cartilage. The function of the palato-pharyngeus is to contract the aperture of the fauces, so as to propel the bolus of food back-

* Columellæ musculus teres, seu azygos uvulæ: Palato-staphylinus: Staphylins ou êpistaphylins moyens: Releveur de la luette.

† The azygos uvulæ muscle is concerned in velu-synthesis, or staphyloraphy.

‡ Syn. Pharyngo-staphylinus: Staphylino-pharyngæus: Thyreo-staphylinus: Pars œsophagæi: Pharyngo-staphylin; thyro-staphylin; peristaphyli-pharyngien: Le pharyngo-staphylin ou palato-pharyngien: Portion du stylo-pharyngien.

wards and downwards in deglutition; in doing which it assists in elevating the pharynx and larynx.*

* The palato-pharyngeus muscle is concerned in velu-synthesis, or staphyloraphy. This operation, which was first performed on my friend, Dr. Stephenson, Professor of Surgery, Montreal, Canada, consists in rendering raw the edges of the cleft velum palati, and approximating them by means of the interrupted suture. It is performed on those born with the malformation of the velum, consisting of two symmetrical halves, being as it were separated into two, by a perpendicular incision from the posterior or inial point of the longitudinal palatine suture, through the centre of the uvula. Sometimes the one half of the uvula is a little larger than the other. The way to perform this operation, is to seat the patient on a chair opposite a good light, to pass a ligature of three or four threads through the one tip of the uvula, by means of one of the smallest curved needles, a little more curved than they usually are, and mounted on a piece of wood, of the thickness of a common quill, and about six inches long. This needle is more easily passed from behind forwards than the reverse, and should be done the moment the patient opens his mouth, otherwise such retraction of the velum takes place in consequence of the action of the circumflexus and levator palati, that the operator is foiled for a time. This muscular retraction, which seems quite involuntary, occurs very frequently, so as to protract this little operation. The other end of the same ligature, which should be about three feet long, is to be passed by another mounted curved needle, through the other tip of the uvula, and this ligature should be equally portioned, so as that a noose commanding each half of the velum may be held out of the mouth, to facilitate the future steps of the operation. The operator should now lay hold of the one-half of the ligature that commands the one side of the velum with the left hand, and stretch it gently; then with the right hand, having Wenzell's or Ware's eye-knife, pare the margin of the velum from the point where it is attached to the palate bones down to the uvula, a step of the operation which is excessively difficult and troublesome, from the involuntary actions of the patient to swallow, vomit, and cough. If the operator does not succeed in rendering the margin sufficiently raw by means of the knife, he must use the curved eye-scissors. The same is now to be done on the other side, and when the operator is satisfied that the edges are sufficiently raw to ensure adhesion, he brings the halves of the uvula together by means of the long ligature, which he ties, but does not yet cut off the loose ends, for by means of them he is so enabled to keep the velum on stretch, as to pass the other needles and ligatures with much more facility. Other two ligatures are required, and may generally be passed, by transfixing the velum with one needle on the one side from before backwards, or glabello-iniad, and on the opposite side from behind forwards, or inio-glabellad, which saves pain and time. These ligatures being tied, and the operator satis-

These little muscles perform various other functions, which will be better understood when we come to deglutition and speech.

Before proceeding to the examination of the muscles of the larynx, it is necessary to describe the objects which it forms.

The larynx is an assemblage of cartilages at the top or beginning of the trachea, opening into the pharynx immediately posterior or iniad to the root of the tongue, and is the commencement of the windpipe; it is held in this situation by several ligaments and muscles, which have been already described, and is lined with a continuation of the same mucous membrane which invested the pharynx. Five cartilages enter into its formation, of which the thyroid and cricoid are the largest, and constitute chiefly the parietes.

The thyroid cartilage, marked S, in Plates VII. and VIII. of Part II., and in Plate III. *Fig.* 1, and Plate IV. *Figs.* 1 and 2, of Part IX., situated on the anterior aspect of the neck, about the superior or atlantal third, is of an angular shape, the angle pointing forwards, or glabello-sternad; and the two flat sides, named alæ, pointing laterad, and terminating in long free edges, which

fied that every point is in contact, he may cut off the loose ends of the ligatures, see his patient to bed, and enjoin absolute quiescence in eating, drinking, speaking, or even swallowing the saliva; for upon this depends the chance of success, and hence it is in vain to attempt this operation under maturity. On the third day after the operation, the stitches should be withdrawn, and the starvation enjoined for two days longer. During the evening of the day of the operation, and the succeeding five days, the patient must be nourished solely with injections made of beef-tea, milk, and gruel. I performed this operation on a young gentleman about eighteen years of age last summer, and succeeded in uniting the edges, with the exception of about a quarter of an inch of the top near the hard palate. This want of union or aperture, however, is now nearly closed, a circumstance which generally occurs after this operation.

look backwards, or dorsad, and end in oblong points named cornua. When insulated, it has some resemblance to the old-fashioned cocked hat. Its superior or atlantal margin is arched on each ala, having a depression, or notch, between the alæ, representing a cordiform appearance, and is terminated at the free posterior edge of each ala, by a small elongated point, which is named the superior cornu, to distinguish it from another cornu at the inferior margin, which is shorter than the preceding. The two superior are marked *s*, *s*, in *Figs.* 1 and 2 of Plate IV., and the two inferior cornua s, s. The posterior free edge, extending between these cornua, is smooth, and nearly straight, as exemplified in these figures. The inferior or sacral margin is slightly concave at each ala. On the convex or lateral aspect of each ala, an irregular oblique ridge extends between the superior and inferior edges, made by the attachments of the crico-thyroideus, the thyro-hyoideus, and constrictor pharyngis inferior muscles. The superior margin of the thyroid cartilage is connected to the os hyoides x, by a membranous expanse extending between them, marked *r*, in *Fig.* 2 of Plate IV., which at *e* is round, stronger, and somewhat ligamentous, and proceeds from the superior cornu *s*, to the cornu *x*, of the os hyoides. This round ligament has generally a small cartilaginous body, either near the superior cornu of the thyroid cartilage, or near the cornu of the os hyoides. This ligament is also stronger and flatter, where it extends between the notch of the thyroid cartilage and the body of the os hyoides. Stronger and shorter ligaments extend between the inferior cornua s, s, to the cricoid cartilage N, and also from the latter to the former; and a strong membranous expanse proceeds from the inferior margin of the thyroid cartilage to the cricoid cartilage, particularly in the centre or me-

sial aspect. Besides these attachments, the thyroid cartilage is connected to the arytenoid cartilages *c*, *c*, by the vocal ligaments *a*, *a*. The thyroid cartilage becomes ossified in advanced life.

The cricoid cartilage, marked N, in Plate VII. of Part II., and in *Fig*. 1 of Plate III., and in *Figs*. 1 and 2 of Plate IV. of Part IX., situated immediately beneath or sacrad to the thyroid cartilage, and atlantad to the first ring of the trachea K, is of a circular or annular shape, as its name indicates, and is much broader posteriorly than anteriorly. The anterior aspect is thick, convex, and narrow; and on each side extending obliquely upwards, there is a conspicuous tubercle, which affords rest and attachment to the inferior cornu of the thyroid cartilage. The posterior aspect, which is very deep, has a distinct line, marked N, in *Fig*. 2 of Plate IV., extending perpendicularly, with a slightly flattened or concave surface on each side. The lower or sacral margin, which rests on the first cartilaginous ring of the trachea, is arched like the sacral margin of the thyroid cartilage, and is connected by a circular ligament. The upper or atlantal margin is very oblique and slightly arched, and immediately superior to each slightly flattened surface, is a gently convex smooth articular surface, for the articulation of the arytenoid cartilage *c*.*

* In Plate VII. of Part II. there is an oblong square space between the thyroid and cricoid cartilages, which is filled up with a thick and strong ligamentous membrane, in which space laryngotomy is performed. This point can be easily ascertained in the living state, from the projection of the anterior angle of the thyroid, and the firm rotundity of the cricoid cartilages. A longitudinal incision should be made in the mesial line of the neck over this part, through the skin and cellular substance, so as to bring into view the contiguous margins of the cartilages, when the operator should then plunge a semicircularly-shaped trocar and canula at this ligamento-membranous space, obliquely downwards into the trachea. This instrument also answers in tracheotomy, and when we consider that by this means we

The arytenoid cartilages *c*, *c*, in *Figs.* 1 and 2 of Plate IV., and in *Fig.* 1 of Plate V., are two small pyramidal, or triangular cartilages, situated with their bases on the upper margin of the cricoid cartilage, and having their apex pointing upwards or atlantad. Their posterior or sacral surfaces are concave; their anterior convex; their external or lateral, oblique and convex; and their inner or mesial surfaces are nearly straight, being only a little concave. Their apices are sometimes so loose as to ap-

prevent blood getting into the trachea, it is the best instrument. Whenever the instrument is inserted, the trocar is instantly withdrawn. Laryngotomy, sometimes named tracheotomy, is performed in suspended animation from drowning, in order to employ the bellows; also in cases of foreign bodies getting into the larynx or trachea; and in cases of foreign bodies entering the œsophagus, threatening instant suffocation, and incapable of being dislodged by the probang.

Tracheotomy, which is an opening made into the trachea, is not so simple an operation as the preceding. A longitudinal incision is made in the mesial line of the trachea, through the skin and cellular substance, when the operator should feel if there be any artery pulsating, as the arteria innominata, and even the right carotid artery, may come in the way of the knife. He must then proceed, cautiously avoiding the isthmus of the thyroid gland, and plunge the same shaped trocar and canula through the rings of the trachea, withdrawing the trocar as soon as the instrument is introduced. This latter operation has been performed in cynanche laryngea and cynanche trachealis, and also for the same diseases as those for which laryngotomy has. Whenever laryngotomy promises to answer, it ought to be preferred. Tracheotomy ought to be performed in cynanche laryngea and trachealis, whenever the practitioner conceives that the inflammatory action has terminated in the suppurative. To perform it sooner, only aggravates the evil, by increasing the inflammatory action, of which I have witnessed not a few instances. I have lately seen three cases of cynanche laryngea occurring in adults, where, besides effusion of matter round and in the glottis, the muscles on the anterior part of the neck, as, for example, the sterno-hyoidei, sterno-thyroidei, omo-hyoidei, and crico-thyroidei, were infiltrated with pus. The symptoms during life were very insidious, two of them appearing as cynanche tonsilaris, the third more severe, and all of them accompanied, when any thing was swallowed, with a convulsive motion of the throat. I was called in by the family practitioners at the close of the scene. I doubt whether, when the lancet and leeches fail in subduing this affection, that tracheotomy will have much effect. The external jugular vein should be opened either in cynanche laryngea, trachealis, or tonsillaris, in preference to a vein of the arm, or leeches.

pear appendages, and in some instances distinct cartilaginous appendages are found. Their bases, which rest on the cricoid cartilage, are gently concave smooth articular surfaces, and are surrounded by a capsular ligament, the articulation admitting of motion in every direction. In *Fig.* 2 of Plate IV., on the right side, the capsular ligament is cut open to show the articulation, which is marked *f.* The arytenoid are connected to the thyroid cartilage S, by the two vocal ligaments *a, a,* which extend from the bases of their anterior or glabello-sternal convex margins, to the angular fossa, on the posterior or dorsal aspect of the thyroid cartilage, where these cords meet or touch each other. The arytenoid cartilages are also connected to the epiglottis ϱ, by delicate broad ligamentous membranes, marked *b,* in *Fig.* 2 of Plate IV., extending between the apices of the arytenoid and the root and sides of the epiglottis, which are named the lateral ligaments of the epiglottis.

The space between these cords, or the entrance into the windpipe, is named the glottis. Immediately above, or atlantad to these two ligaments *a, a,* are two small pouches, or sacculi, or recesses, marked v, in *Fig.* 2 of Plate IV., named the ventricles of the larynx, which are formed of the mucous membrane of the larynx. Two ligaments are situated immediately above or atlantad to these ventricles, and extend between the arytenoid and the thyroid cartilages, from the centre of the convex anterior margin of the arytenoid, immediately above or atlantad to the vocal chord, and are attached to the angular fossa on the posterior or dorsal aspect of the thyroid cartilage, also immediately above or atlantad to the vocal chords; so that the fissures or ventricles are between these ligaments and the vocal chords.

The epiglottis ϱ, in Plate II., in *Fig.* 1 of Plates III.

IV. and V., situated at the root of the tongue, which it very much resembles in appearance, is a small cartilaginous body, attached to the upper margin of the thyroid cartilage and the os hyoides, through the medium of ligaments, but more so to the former than the latter. In *Fig.* 2 of Plate IV., the epiglottis Q is partially bent backwards and downwards, which brings into view a small ligament, marked *d*, extending between its base and the body of the os hyoides X: the base is also connected to the notch of the upper margin of the thyroid cartilage, so that a triangular space is left between these two ligaments, the epiglottis, and that extending between the os hyoides and the notch of the thyroid cartilage, which is filled up with ligamentous substance. The lateral ligaments of the epiglottis, marked *b*, in *Fig.* 2 of Plate IV., extend between the sides of the epiglottis and the tips of the arytenoid cartilages. Other membranous ligaments extend upwards from the sides of the epiglottis, to the sides of the fauces, as represented in *Fig.* 1 of Plate III.

The os hyoides X, in Plate VII. of Part II., and in Plates I. II. III. *Fig.* 1., and IV. *Fig.* 2, situated horizontally at the root of the tongue, is a slender round bone, of the shape of the Greek υ, from which it has got its name, and consists of a body and two cornua. All the views excepting that in *Fig.* 2 of Plate IV., are representations of the outer convex aspect of the bone, and give a more natural appearance than this. In this, however, which is an internal or central view, we perceive the body of the bone X, and the two cornua *x*, *x*; and extending outwards from the body X, we observe two little projections, named appendices.* The body is much thicker and stronger

* Syn. Styliform processes, crura superiora, ossa graniniformia.

than the rest of the bone, is convex outwardly, or peripherad, having a delicate perpendicular ridge in the centre, and concave inwardly or centrad, and until mature age it is not joined to the cornua by cartilage. There are several small elevations and depressions made by the muscles, already described, and therefore unnecessary to be particularized at present. The cornua extend laterad and iniad or dorsad, and end in small round points, or tubercles, from which moveable cartilages project, to meet the superior cornua of the thyroid cartilage.

I shall now proceed to the investigation of the muscles of the larynx, of which there are several.

The crico-arytænoideus posticus* *m*, *Fig.* 1, Plate IV., situated on the posterior aspect of the cricoid cartilage, as its name indicates, derives its origin from the flattened surface of the cricoid cartilage N, as represented in *Fig.* 2, ascends with oblique fibres, to be inserted in the posterior aspect of the root of the arytenoid cartilage *c*. The function of this muscle is to inflect directly backward the arytenoid cartilage, and through it, to render tense the vocal chord.

The crico-arytænoideus lateralis† *p*, is merely the outer or lateral portion of fibres of the preceding muscle, and therefore will have the effect of pulling the arytenoid cartilage backwards and outwards, and by this means separate the vocal chords, so as to widen the glottis.

* Syn. Propriorum laryngis quintus et sextus: Secundus musculorum laryngis seu par cucullare: Ex propriis laryngis musculis posterior: Crico-arytænoideus: Crico-arytænoideus posterior: Dilatateur postérieur: Crico-creti-arithénoïdien: Le crico-aryténoïdien postérieur.

† Syn. Propriorum laryngis septimus et octavus: Musculorum laryngis tertius: Ex propriis laryngis musculis, internorum primum par: Le crico-arytenoïdien-lateral: Le crico-lateri-arithénoïdien.

The arytænoidei obliqui* *r*, *r*, are short muscular fibres, extending from the base of the one arytenoid cartilage to the apex of the other, mutually crossing each other; one of them, however, is occasionally deficient. Their function is to approximate these cartilages, and through their medium to diminish the aperture of the glottis.

The arytænoideus transversus† *t*, is a short arrangement of muscular fibres, which extend directly across from the one arytenoid cartilage to the other, and are attached to the inner or mesial aspect, from the apex to the base. Its function is to approximate the arytenoid cartilages, and thus to narrow the glottis.

The thyro-arytænoideus‡ *g*, derives a broad extensive origin from the interior or central surface of the thyroid cartilage, and ascends with converging fibres, to be inserted in the outer aspect of the base of the arytenoid cartilage, embracing the ventricle of the glottis in its course. Its function is to pull the arytenoid cartilage forwards, backwards, and outwards, so as either to stretch or relax the ligaments of the glottis, and by its forming the wall of the ventricle and the lip of the glottis, it is the chief muscle employed in the modulation of the voice.

* Syn. Arytænoideus minor: Thyro-arytænoïdes obliquus atque ary-epiglottidæus: L'aryténoïdien croisé, le crico-aryténoïdien supérieur et l'aryténo-epiglottique: L'aryténoïdien oblique: L'aryténoïdien.

† Syn. Propriorum laryngis undecimus ac duodecimus: Musculus extremus laryngis omnium minimus: Musculus laryngis conjuge destitutus: Arytænoïdeus: Aristænoideus major: Arytænoïdeus proprius: Ary-arytænoïdis fibræ interiores: Arytænoïdes: Arytenoïdien transversal.

‡ Syn. Propriorum laryngis nonus et decimus: Ex propriis laryngis musculis, internorum secundum par: Quartum par laryngis propriorum: Thyro-arytænoïdes; una cum thyro-epiglottidæo majore: Thyreo-arytænoïdeus: Le thyro-arytenoïdien.

The thyro-epiglottideus and arytæno-epiglottideus muscles, are so delicate as scarcely to be distinguishable; and, as their names indicate, they extend between these different cartilages. The arytæno-epiglottideus muscle is represented in *Fig.* 1 of Plate IV., marked *q*, consisting of very slender fibres, which run from the apex of the arytenoid cartilage *c*, along the outer aspect of the rima glottidis, to the side of the epiglottis Q. This muscle is so delicate as to be more distinctly seen when the mucous membrane is allowed to remain on, than when dissected off. The function of this pair of muscles is to approximate the epiglottis to the arytenoid cartilage, and thus to shut the glottis in deglutition.

The thyro-epiglottideus arises from the thyroid cartilage, and is inserted in the side of the epiglottis; but the fibres are so pale and separated, as to be with difficulty seen. These fibres assist the arytæno-epiglottideus in its functions.

When the pharynx, larynx, and inferior maxillary bone have been removed, three pair of muscles are found on the anterior or glabello-sternal aspect of the cervical vertebræ, viz. the longi colli L, the recti antici majores R, and the minores r, represented in Plates I. and II., and in *Fig.* 1 of Plate III.

The longus colli* muscle, marked L in Plate II. is situated on the anterior aspect of the cervical vertebræ, close to the mesial line, and derives a fleshy and tendinous origin from the sides of the bodies of the three atlantal or superior dorsal, and from the transverse processes of the four or five inferior or sacral cervical vertebræ; the fibres

* Syn. Pars eadem primi et secundi dorsum moventium: Primi cervicis musculi: Pars alterius lateris musculi stomacho subjectorum: Longus: Cervicem flectentium primi paris, sive longi: Le long du cou: Pré-dorso-atloïdien: Pré-dorso-cervical.

ascending obliquely mesiad, to be inserted in the bodies of all the cervical vertebræ. The function is to inflect the neck laterad, and when both muscles are in action, to inflect it directly forwards or sternad.

The rectus capitis anticus major,* marked R, in Plates I. and II., and in *Fig.* 1 of Plate III., is situated immediately on the lateral aspect of the upper half of the longus colli, derives a fleshy and tendinous origin from the anterior aspect of the transverse processes of the third, fourth, fifth, and sixth cervical vertebræ, and ascends to be inserted in the cuneiform process of the occipital bone, anterior or glabellar to the condyle. Its function is to inflect the head slightly laterad, and when both muscles act, directly forwards or sternad. It has also a slight effect in rotating the head on the vertebra dentata.

The rectus capitis anticus minor† muscle r, in *Fig.* 1 of Plate III., is also situated on the anterior or glabellar aspect of the cervical vertebræ, and is obscured by the rectus major; it derives a fleshy origin from the anterior aspect of the body of the atlas, and ascends to be inserted in the cuneiform process of the os occipitis, nearer the condyle, and more laterad than the rectus major. Its function is to inflect the head forwards or sternad.

The scaleni muscles, which I shall next describe, are divided variously by different authors, some making one,

* Syn. Pars eadem primi et secundi dorsum moventium, pars in os occipitis inserta: Primi cervicis musculi pars occipitio annexa: Nonus musculus capitis: Alterius lateris musculi stomacho subjectorum, portio in occipitis os inserta: Qui cum mastoideo caput flectit: Rectus internus major: Rectus capitis internus major: Le grand droit antérieur de la tête: Grand trachelo-sous-occipital: Grand trachelo-basilaire.

† Syn. Rectus internus minor: Le rengorgeur oblique: Rectus anticus minor: Le petit droit antérieur de la tête: Petit trachelo-sous-occipital: Petit trachelo-basilaire.

and others no less than five. I shall follow the arrangement of Boyer, who makes only two, as it is more natural and simple.

The scalenus anticus* muscle, marked L, in Plates I. VII. and VIII. of Part II., is situated on the lateral aspect of the cervical vertebræ, immediately exterior or lateral to the longus colli, and separated from the scalenus posticus by the subclavian artery and axillary plexus of nerves; it arises by distinct tendons from the fourth, fifth, and sixth cervical vertebræ, which soon become fleshy, and form a flat muscle, which is inserted in the tubercle, (marked *h*, in *Fig.* 8 of Plate II. in Part I.), on the atlantal surface of the first rib, marked 64, in Plates VII. and VIII., near its cartilage.† The function of this muscle is to inflect the neck laterad, and when the neck becomes the fixed point, to elevate the ribs, as in active inspiration; when both muscles act, they bend the neck and head sternad or forwards.

The scalenus posticus‡ muscle, marked 50, in Plate VII. of Part II., and in Plate VI. of Part IV., is situated immediately dorsal to the scalenus anticus L, being only separated by the subclavian artery and the axillary plexus of nerves; it derives its origin from the transverse processes of all the cervical vertebræ, by distinct tendons, and descends to be inserted in the atlantal surface of the first rib, nearer its head than the insertion of the scalenus

* Syn. Tertius et quartus dorsum moventium: Secundus cervicis musculus: Septimus thoracis: Scalenus: Par triangulare: Scalenus primus: The first scalenus: Le premier scalène: Costo-trachélien: Trachelo-costal.

† The scalenus anticus muscle relates to the securing of the subclavian artery, as described in page 71 of Part II.

‡ Syn. Tertius et quartus dorsum moventium: Secundus cervicis musculus: Octavus et nonus thoracis: Scalenus: Par triangulare: Scalenus secundus et tertius: Le second scalène: Scalenus minimus, lateralis, medius, et posticus: Costo-trachélien: Trachelo-costal.

anticus, and also in the atlantal edge of the second rib, near its articulation with the dorsal vertebræ. Its function is to inflect the neck laterad, and when the neck is a fixed point, to elevate the ribs, as in active respiration; when both muscles act, they bend the neck and head slightly dorsad or backwards.

I shall now proceed to the muscles of the face, which, I formerly observed, should have been examined first. Great care is requisite in dissecting these, as they are either adherent to the skin, or involved in the adipose substance, according to the emaciation or plumpness of the countenance. They are mostly all represented in Plate X. of Part II.

The student should begin with the occipito-frontalis q, and then proceed in succession to the orbicularis palpebrarum w, the compressor naris n, the levator labii superioris alæque nasi i, the zygomaticus minor e, the zygomaticus major a, the depressor anguli oris b, the orbicularis oris f, the depressor labii inferioris 70, the levator labii inferioris, the depressor labii superioris alæque nasi, the buccinator h, and the masseter l. The different superficial muscles of the face should be developed at once, as they are so blended with each other, that the student cannot comprehend them until this is done.

The occipito-frontalis* muscle q, in Plate X. of Part II., is chiefly a tendinous expanse, situated between the integuments of the scalp and the periosteum of the cranium, adhering intimately to the former. It derives its origin either from the anterior or posterior aspect of the

* Syn. Pars carnea anterior, musculosa frontis cutem movens substantia: Partes ejus carneæ posteriores sunt supercilium trahentes et musculi frontis: Occipitii musculi, et musculus frontis: Occipitales, et musculi frontales: Musculi cutis frontis: Epicranius: Les muscles occipitaux, et les muscles frontaux: Muscle épicrane.

cranium, by two fleshy slips, or bellies; the anterior arise from the superciliary ridges of the frontal bone, where they are incorporated with the corrugatores superciliorum, and the orbiculares palpebrarum, and where they send down a fleshy slip to the compressor naris and levator labii superioris alæque nasi. The two fleshy bellies ascending on the cranium, separate more and more, assume a semicircular shape, and are lost in the tendinous expanse, before they arrive at the coronal suture: this expansive tendon proceeds backwards or iniad, and on each side or laterad, until it again forms two fleshy bellies, which are attached to the superior transverse ridge of the occipital bone, and to part of the temporal bone continuous with it. These posterior bellies are much stronger both in their carneous and tendinous fibres, especially the latter, than the anterior. The tendinous expanse unites both the anterior and posterior fleshy bellies to each other, and descends on each side superficial to the temporal aponeurosis, and beneath or centrad to the attollens aurem r, towards the ear, where it is attached to the zygoma.*

To display this muscle, a longitudinal incision must be made from the root of the nose over the cranium, to the superior transverse ridge of the occipital bone, cautiously through the skin, when the peculiar granulated fat will direct the student that he has arrived at the tendinous expanse. The skin is then to be carefully dissected off, the dissector never proceeding deeper than this granulated fat.

The function of the occipito-frontalis muscle is to cor-

* The occipito-frontalis is materially concerned in punctured wounds of the scalp. When inflammation supervenes, an incision is made across the fibres of the tendon to remove the tension, and when suppuration takes place, the same direction of incision is made. This muscle is also concerned in opening the temporal artery, see Part II. page 48.

rugate the skin of the scalp and forehead, to elevate the eye-brows and eye-lids, to wrinkle the skin of the nose, and to assist in knitting the eye-brows.

The orbicularis palpebrarum* muscle w, in Plate X. of Part II., situated between the skin and the eye-lids, is a delicate arrangement of circular muscular fibres, deriving their origin from the nasal process of the superior maxillary bone, encircling the upper and lower eye-lids, or tarsi, and inserted in the outer edge of the orbitar process of the superior maxillary bone, near their origin. Here they are intimately connected with the ligament of the tarsi, and more or less so with the lacrymal sac. As the fibres sweep round the lower eye-lid, they adhere to the tarsus, and overlap and join the fibres of the levator labii superioris alæque nasi i, and also those of the zygomaticus minor e, which latter is frequently a slip of this muscle. As the fibres run round the upper eye-lid, they adhere to the tarsus, to the occipito-frontalis, the corrugator supercilii, and the internal angular process of the os frontis. To dissect this muscle, nearly as much care and patience are requisite, as in the displaying of the occipito-frontalis, and the student should display first the fibres of the lower, as they are much bolder than those of the upper eye-lid.

The function of this muscle is to open or shut the eye-lids, to compress the eye-ball and the lacrymal gland, and to convey the tears towards the puncta lacrymalia.†

The student may now proceed either to the examina-

* Duo palpebrarum musculi: Palpebrarum primus, orbicularis: Exterior qui totum oculum ambit: Orbicularis palpebræ musculus major: Orbicularis latus cum ciliari: Qui claudentes palpebras, sive semicirculares: Sphincter: Orbicularis oculi: Le muscle orbiculaire des paupières: Naso-palpébral: Maxillo-palpébral.

† The orbicularis palpebrarum relates to the opening of the lacrymal sac in fistula lacrymalis. This muscle, and no other, should be cut in the operation.

tion of the corrugator supercilii, or the compressor naris. I shall describe the latter here, as the former will be represented in one of the plates of the eye.

The compressor naris* muscle n, Plate X. of Part II., situated across the nose, immediately beneath the integuments, is a delicate arrangement of muscular fibres, deriving their origin from the ala nasi, and the levator labii superioris alæque nasi, and ascending with parallel fibres to the dorsum or bridge of the nose, where they join those of the opposite side, and the fibres of the occipito-frontalis. Their function is to compress or expand the anterior apertures of the nares, and to corrugate the skin of the nose.

The levator labii superioris alæque nasi† muscle i, Plate X. of Part II., situated between the eye and the side of the nose and upper lip, derives its origin from the nasal process and the margin of the orbitar and malar processes of the superior maxillary bone, onwards to the cheek-bone, from which the fibres descend obliquely inwards, to be inserted in the skin of the upper lip and orbicularis oris, and cartilaginous ala of the nose. In some subjects, there is a slight separation of the origin, the portion which originates from the nasal process being apart from that which arises from the orbitar process, and hence the muscle is divided into two by some

* Syn. Nasum dilatantes: Frontalis pars per dorsum nasi ducta: Elevator alæ nasi: Transversus: Fronto-nazal: Procerus nasi: Pyramidal du nez.

† Syn. Musculus supercilii musculo junctus, superiori labro insertus: Ex propriis qui superius labrum sursum trahit: Pars primi nasi alas abducentis: Dilatator seu retractor alæ nasi et elevator labii superioris: Pars elevatoris labii superioris proprii: Elevator proprii labii superioris seu incisorius: La grande et la petite portion de l'incisif latéral: Releveur de la lèvre supérieure et de l'aile du nez: Grand sus-maxillo-labial, et moyen sus-maxillo-labial: Maxillo-labii-nazal, et orbito-maxilli-labial.

authors. The origin is overlapped by the orbicularis palpebrarum.* The function of this muscle is to elevate the upper lip, and to expand or dilate the anterior aperture of the nares.

The zygomaticus minor muscle† e is a very delicate assemblage of muscular fibres, which are frequently deficient, situated on the outer or inio-lateral margin of the levator labii superioris alæque nasi muscle i, with which they are not unfrequently connected. This slender muscle is either a production of the orbicularis palpebrarum w, or derives its origin from near the middle of the external surface of the os malæ, and descends to be attached to the orbicularis oris f, and the upper lip, near the angle of the mouth. Its function is to elevate the upper lip, especially the angle of the mouth.

The zygomaticus major muscle‡ a, is a bolder assemblage of muscular fibres than the minor, having a similar course, and situated on its outer or inio-lateral margin. It derives its origin from the zygomatic process of the os malæ, and descends obliquely to the angle of the mouth, where it is attached to the skin, the orbicularis oris, and the depressor anguli oris. Its function is to elevate the angle of the mouth upwards and outwards. The platysma myoides, already described, may be with great propriety dissected at this period, as its fibres are blended with those of the depressor anguli oris b.

The depressor anguli oris§ muscle b, is a triangular

* The levator labii superioris is concerned in the division of the infra-orbitary nerve in neuralgia, as described in page 65 of Part II.

† Syn. Le petit zygomatique: Petit zygomato-labial.

‡ Syn. Unus ex quatuor musculorum labris propriorum: Zygomaticus: Primi paris, sive attollentis labium superius: Le grand zygomatique: Grand zygomato-labial.

§ Syn. Pars alterius lateris primi musculi eorum qui buccas et labra movent: A menti lateribus adscendens in labrum supernum: Labium superius deorsum

arrangement of muscular fibres, extending between the inferior maxillary bone and the angle of the mouth, immediately beneath the integuments. It derives an extensive origin from the base of the inferior maxillary bone, (marked with the letters *a*, *a*, in *Fig*. 25 of Plate VI. of Part I.), and ascends with converging fibres, to be attached to the angle of the mouth, where its fibres mingle with those of the orbicularis oris f, and those of the zygomaticus major a. In its course the outer or inio-lateral fibres are blended with those of the platysma myoides F. Its function is to depress the angle of the mouth.

The orbicularis oris* muscle f, is a circular arrangement of muscular fibres encircling the lips, formed apparently in some measure by the insertion of the various muscles around, viz. the levator labii superioris alæque nasi, the depressor labii superioris alæque nasi, the two zygomatici, the levator anguli oris, the depressor anguli oris, and the depressor labii inferioris, with which they are connected. The fibres adhere intimately to the skin, so that they are with some difficulty displayed elegantly; they run along the upper and lower lips, and are either continuous or decussate at the angles: to me they appear to be continuous. Their function is to open or shut the

movens, a mento in illud labium delatus: Ex propriis quo superius labrum deorsum movetur: Quarti paris propriorum labiis: Depressor labiorum: Depressor labiorum communis: Labrorum communis depressor, seu triangularis: Le triangulaire ou abaisseur de l'angle des lèvres: Maxillo-labial: Sous-maxillo-labial.

* Syn. Moles carnea, musculosa tamen, quæ utrumque labium format: Musculus orbicularis: Quartum par constringens: Constrictor labiorum sive orbicularis: Sphyncter labiorum: Les sur-demi-orbiculaires: Le muscle orbiculaire des lèvres: Labial.

mouth, and to perform various motions in speech, gesture, and deglutition.*

The levator anguli oris† muscle o in Plate IX. of Part II., situated beneath or centrad to the levator labii superioris alæque nasi i and the zygomatici e, a, derives its origin from the superior maxillary bone immediately below or basilad to the infra-orbitary foramen *o*, and the infra-orbitary nerve 2; and descends obliquely to be inserted in the angle of the mouth, where its fibres mingle with those of the orbicularis oris f, and the depressor anguli oris b. Its function is indicated by its name.

The depressor labii superioris alæque nasi‡ muscle *s*, in *Fig.* 3 of Plate IV. of Part IX., is situated between the upper lip and the alveolar processes of the superior maxillary bone. To display it, the upper lip must be held up, as represented in the diagram, and the lining membrane of the mouth carefully removed, when the fibres will be seen to arise from the alveolar processes of the two incisive and canine teeth of the one side, and to ascend to be inserted in the upper lip, and cartilaginous ala of the nose, the fibres intermingling with those of the orbicularis oris. Its function is to antagonize the levator labii superioris alæque nasi, and consequently depresses the upper lip, and contracts the anterior aperture of the nares by pulling downwards the cartilaginous ala of the nose.

* This muscle is concerned in the operations for hare-lip and cancer of the lips.

† Syn. Secundus ad latera trahens sive abducens: Elevator labiorum: Elevator labiorum communis: Elevator labiorum seu caninus: Le canin: Petit sus-maxillo-labial.

‡ Syn. Constrictor alæ nasi ac depressor labii superioris: Depressor labii superioris proprius: Musculus labri superioris arctandis naribus communis, ac myrtiformis seu pinnarum dilatator proprius: L'incisif mitoyen: Depressor alæ nasi: Labial: Maxillo-alveoli-nasal.

The depressor labii inferioris* muscle, marked 70 in Plate X. of Part II., situated between the lower lip and the chin, is a scattered arrangement of delicate muscular fibres, adhering so intimately to the skin that they are with difficulty displayed. These fibres derive their origin from the base of the inferior maxillary bone, as indicated in *Fig.* 25 of Plate VI. of Part I., between the symphysis menti *c* and midway between the letters *a*, and ascend obliquely mesiad, uniting with those of the opposite side, to be inserted in the lower lip, the orbicularis oris, and the skin. The origin is overlapped by that of the depressor anguli oris. The function of this muscle is indicated by its name, depressing the lower lip downwards and laterad; and when both muscles act, depressing the lip directly downwards or basilad.†

The levator labii inferioris,‡ marked *i* in *Fig.* 3 of Plate IV. of Part IX., is situated on each side of the frenum labii inferioris; and in order to display it, the lower lip must be held downwards, as represented in the drawing. This muscle derives its origin from the alveolar processes of the incisive and canine teeth, and descends in a fan-like shape, to be inserted in the lower lip. It can generally be seen shining through the lining mucous membrane of the mouth. This muscle, as its name indicates, elevates the lower lip.§

* Syn. Unus ex quatuor musculorum labris propriorum duobus inferioribus: A quo labrum inferius deorsum movetur: Tertii paris, deprimentis inferius labrum: Quinti paris propriorum labiis: Depressor labii inferioris: Depressor labii inferioris proprius: Labri inferioris depressor proprius: Le quarrè du menton ou abaisseur de la lèvre inférieure: Mento-labial: Mentonnier-labial.

† The depressor labii inferioris is concerned in cancer of the lower lip.

‡ Syn. Elevator labii inferioris: Elevator labii inferioris proprius; Elevator menti: De la houppe du menton, ou l'incisif inferieur: Portion de mento-labial: Sous maxillo-cutané.

§ The levator labii inferioris is in some degree concerned in dividing the branch of the inferior maxillary nerve, which emerges at the mental foramen.

The masseter muscle,* marked 1 in Plates IX. and X. of Part II., is a bold, tendinous, and fleshy mass, situated on the side of the face, extending between the cheek-bone and the lower jaw-bone. It derives its origin, which is partly fleshy and partly tendinous, from the inferior or basilar edge and zygomatic process of the os malæ, and from the zygomatic process of the temporal bone; and descends along the ramus of the inferior maxillary bone, to be inserted partly in the ramus, and partly in the angle of the same bone. Its function is to approximate the inferior to the superior maxillary bone, and is therefore employed in breaking and triturating the food, but more so in the former than in the latter action.†

The buccinator muscle‡ h, in Plates VIII. IX. and X. of Part II., situated beneath or centrad of the masseter, zygomatici, and depressor anguli oris muscles, and immediately exterior or peripherad of the mucous membrane of the mouth, derives a tendinous and fleshy origin from the alveolar processes of the superior and inferior maxillary bones, and proceeds with straight or horizontal fibres to be inserted in the angle of the mouth and orbicularis oris. The function of this muscle is to inflate or compress the cheeks, and to draw the angle of the mouth backwards, and therefore employed in mastication to move the bolus of food from one side of the mouth to the other.§

* Syn. Inferiorem maxillam moventium alterius lateris secundis, seu masseter: Masseterius et mansorius dictus: Masseter: Tertius attollens maxillam masseter: Tertii paris laterales: Zygomatico-maxillaire.

† The masseter muscle is concerned in extirpation of the inferior maxillary bone, when affected with spina ventosa, and also in luxation of this bone.

‡ Syn. Buccarum, labrorum, et nasi alarum secundus alterius lateris: Musculus buccæ: Bucco: Contrahens communis buccarum labiorumque: Le buccinateur: Bucco-labial: Alveolo-maxillaire.

§ The buccinator is concerned in wounds and operations of the face, and in fistula of the parotid duct, this tube piercing the muscle, as seen in Plate X. of Part II., marked x.

The temporal muscle* u, in Plates VIII. and IX. of Part II., and in Plate II. of Part IX., situated on the side of the face, beneath the occipito-frontalis muscle, and having a strong tendinous aponeurosis covering it, derives its origin from the temporal depression of the frontal, parietal, temporal, and sphenoid bones; and descends with converging fibres below the jugum or zygoma, to be inserted in the coronoid process of the inferior maxillary bone, and also along the ramus. The tendinous aponeurosis of this muscle is attached all round the muscle to the scabrous ridge, marked *e* in *Fig*. 1 of Plate IV. of Part I., and to the zygoma. The muscle has elegant glistening tendinous fibres exteriorly or peripherad, and fleshy fibres internally or centrad. The function of this muscle is to approximate the inferior to the superior maxillary bone; and it is therefore employed in breaking and triturating the food, but more so in the former than in the latter function.†

The two pterygoid muscles should now be investigated; they are situated centrad or within the ramus of the inferior maxillary bone, and are named external and internal, appellations however which do not distinguish them clearly from each other. To display them with satisfaction, the inferior maxillary bone should be sawn midway between the symphysis menti and angle of the bone.

The pterygoideus internus‡ muscle n, in Plate VIII. of

* Syn. Inferiorem maxillam moventium primus alterius lateris musculus, seu temporalis: Le temporal ou crotaphite: Temporo-maxillaire: Arcadi-temporo-maxillaire.

† The temporal muscle is concerned in extirpation of the inferior maxillary bone, when affected with spina ventosa, and in luxation of this bone.

‡ Syn. Tertius musculus qui in ore latitat: Musculus in ore latitans: Latens in ore: Quinti paris maxillam abducens: Paris pterygoidis sive alaris interni: Pterygoides interior: Le grand ptérygoïdien ou ptérygoïdien interne: Le grand ptérygo-maxillaire: Ptérygo-anguli-maxillaire.

Part II., and in Plates II. and III., *Fig.* 1, situated internally or centrad to the ramus of the inferior maxillary bone, derives its origin from the fossa between the two pterygoid plates of the sphenoid bone, and descends to be inserted on the inner or central aspect of the angle, and part of the ramus of the inferior maxillary bone. The internal maxillary artery *f* separates this muscle from the pterygoideus externus. Its function is to move the inferior maxillary bone on the superior from side to side or laterally, and hence employed in triturating the food in mastication.*

The pterygoideus externus† muscle t, in Plate VIII. of Part II., and in Plates II. and III., *Fig.* 1, of Part IX., situated coronad or above the pterygoideus internus, and separated from it by the internal maxillary artery *f*, derives its origin from the external pterygoid plate of the sphenoid bone, the bulbous process of the superior maxillary bone, and the root of the temporal process of the sphenoid bone, and extends directly across with horizontal fibres to be inserted in the cervix and capsular ligament of the articulation of the inferior maxillary bone. The function of this muscle, like that of the pterygoideus internus, is to move the inferior maxillary bone laterally, or from side to side; and it is therefore employed in triturating the food in mastication.‡

Having examined all the muscles in this region, I shall

* The pterygoideus internus muscle is concerned in extirpation of the inferior maxillary bone, and in luxation of this bone.

† Syn. Novi paris musculorum: Musculi temporalis illa pars quod ab externa sede processuum, quos vespertilionum alis comparamus: Quintum par exerendæ Fallopio adscriptum: Quarti paris pterygoïdes abducentis: Pterygoïdes exterior: Le petit pterygoïdien ou pterygoïdien externe: Petit pterygo-maxillaire: Pterygo-colli-maxillaire.

‡ The pterygoideus externus is concerned in extirpation of the inferior maxillary bone, and in luxation of this bone.

now proceed to the ligaments of the articulation of the inferior maxillary bone.

The condyloid process of the inferior maxillary bone is articulated simply by a capsular ligament, marked *c* in Plates I. II. and III., *Fig.* 1, of Part IX. This capsule arises around the glenoid cavity *e* of the temporal bone, glides over the condyle *b* of the inferior maxillary bone, to be inserted round the cervix. Within this capsule is interposed an interarticular cartilage *h*, which is concave on both surfaces, and adheres to the capsular ligament.*

* In page 61 of Part I., the motions of the inferior maxillary bone are described; and it is there mentioned that luxation occurs most frequently in children, in consequence of the shallow state of the articulation. This bone is only luxated forwards, an accident which occurs most commonly while yawning; it has been however produced by laughing, gaping, or biting too large an object; also by a blow on the chin while the mouth is wide open, and during the extraction of a tooth. Considerable pain is experienced, which the patient is unable to describe from the extended state of the mouth, the saliva flows in profusion, a large depression is felt before the ear, a prominence under the cheek-bone, and the cheeks and temples are flatter than usual. The accident cannot be mistaken. If not reduced, the patient can neither speak nor swallow for the first five days. In a few weeks the symptoms are not so strongly marked, the chin gradually approximates the superior maxilla, the individual recovers progressively the power of speaking and swallowing, but still stammers and slavers from the mouth. Occasionally only one condyle is luxated, and then the mouth is distorted and turned to one side, while the teeth of the two maxillæ do not correspond. To reduce this luxation, the operator puts on a pair of thick gloves, inserts his thumbs far back on the last molares, and places his fingers under the chin; he then gradually depresses the molares, while at the same time he elevates the chin, and when the luxation is reducing, the operator should endeavour, by gliding his thumbs to the sides, between the teeth and the cheeks, to prevent them being checked. If gloves are not at hand, cotton or linen may be rolled round the thumbs. When the reduction is accomplished, a four-headed roller should be applied, placing the centre or union of the heads under the chin, and then carrying two of the ends upwards to the crown of the head, and the other two backwards to the occiput. The patient should abstain from eating any hard food for some time, as this luxation is very liable to recur.

When the greater portion, or the whole of the inferior maxillary bone, requires to be removed for spina ventosa, the operator must divide one or both of the

I have not yet described the ligaments peculiar to the atlas and dentata. These are represented in *Fig.* 2 of Plate III. of Part IX.

In this figure, the letters D point out the extension of the dura mater, or theca vertebralis; and the letter E the ligamentum commune posticum, both of which are reflected off, to show these ligaments. The ligamentum

cheeks from the angle of the mouth backwards or iniad, to the parotid gland, avoiding its duct; (the facial artery will be wounded in this incision, and require to be secured); he should then dissect the lower lip and the lining membrane of the mouth from the bone, cutting across, at the same time, the origins of the levator labii inferioris, the depressor labii inferioris, and the depressor anguli oris muscles, and divide the maxillary bone, at the symphysis menti, with the saw, which will give great facility to the performance of the remainder of the operation; and in doing which one of the mesial incisive teeth may require to be removed. If only one side of the bone requires removal, he should separate first the insertions of the genio-hyo-glossus, genio-glossus, genio-hyoideus, and anterior head of the digastric muscles, next that of the mylo-hyoideus, thirdly, that of the masseter muscle, keeping close to the bone, fourthly, that of the temporal muscle, keeping in view the internal maxillary artery; probably large bone nippers will answer better to cut across the coronoid process, leaving the division of the insertion of the temporal muscle until the operation is nearly finished. He should now divide the insertion of the pterygoideus internus from above downwards, keeping the back of the knife towards the internal maxillary artery, and cutting across at the same time the osseous branch of the inferior maxillary nerve, with its accompanying artery and vein. When this is done, he will feel the internal maxillary artery pulsating, and will be able to divide the insertion of the external pterygoid muscle, keeping the back of the knife to the artery, and cutting upwards or coronad. Lastly, by depressing the symphysis of the bone, he will now be able to cut around the capsular ligament, and detach the one-half of the bone. In all the cases wherein this dexterous operation has been performed, it has not been necessary to remove the condyle of the bone, and a chain-saw has been used to cut through the ramus; large bone nippers will be found to answer better. Should the whole bone be diseased, the same must be done on the opposite side. After the removal of the bone, the wound in the cheek or cheeks is to be brought together by stitches, adhesive plaister, compresses, and bandages. The patient should be fed on spoon-meat or liquids for some time. When we reflect that spina ventosa attacking this bone is incurable by any milder means, we should not hesitate to perform such an operation. The cases recorded of the operation have fortunately succeeded.

commune posticum E extends, like the anticum, from the foramen magnum of the occipital bone, to the coccyx, but is not so strong a ligament. That portion of the ligamentum commune anticum and posticum, which extends from the foramen magnum of the occipital bone to the atlas, is named by some authors the circular ligament. The ligamentum commune anticum is described in Part VI. page 161. The ligamenta subflava are short strong ligaments, which extend from the ring *b* of the one vertebra to that *b* of the other. One of which is distinctly seen in *Fig*. 6 of Plate XII. of Part VIII., extending between the atlas and dentata. In *Fig*. 2 of Plate III. they are merely covered by the theca vertebralis.

Some of the capsular ligaments of the articular processes are also displayed in *Fig*. 2 of Plate III. The letters c indicate these capsules, one of which, viz. that between the vertebra dentata and the atlas, is cut open to show the pouch; these ligaments adhere around the smooth articular processes of the vertebræ, and are rather delicate capsules. The inferior or sacral c is placed on one of the articular surfaces of the vertebræ.

The intervertebral cartilage C, connecting the bodies of the vertebræ, is also displayed in *Fig*. 2 of Plate III. This is a soft spongy elastic body, with a mucous fluid in the centre.

The transverse ligament of the atlas, marked with the digit 1, in *Figs*. 1 and 2, is a very strong broad ligament, of a yellowish colour, extending between the tubercles of the atlas (marked *i*, in *Fig*. 5 of Plate II. of Part I., the dotted line receding on each side from the letter *i*, indicating the course of the ligament). This confines the processus dentatus of the vertebra dentata, and prevents it disturbing or injuring the spinal cord, during the rotatory motions of the head.

The digits 2 indicate the lateral ligaments, which extend between the sides of the tip of the processus dentatus *n*, and the margin of the foramen magnum *k* (the precise points being marked *n*, in *Fig.* 5 of Plate V. of Part I.) These lateral ligaments are of a round figure, very strong, and moderate the rotatory motions of the head.

The digit 3 points out the perpendicular ligament, which extends from the processus dentatus *n*, to the margin *m* of the foramen magnum *k*. This ligament is of a flattish figure, much more slender than the lateral, and assists in moderating the flexion of the head forwards or sternad.*

The general motions of the vertebræ are detailed in page 8 of Part I. The nodding motions of the head are

* As observed in page 9 of Part I., the vertebræ are in a manner so firmly locked together, by the vertical direction of their articular processes which overlap each other, by the intervertebral cartilage, by the strong ligaments, as the crucial, the common anterior and posterior, the subflava, the capsular, the intertransverse and interspinous, also by a number of short muscles, that dislocation seldom or never occurs. We may therefore always look for fracture of these bones, or fracture and luxation; for when once any of them is fractured, we can easily conceive that luxation may also occur. Thus, suppose the articular processes either of the superior or the inferior vertebra, to be fractured; these articulations may then be easily luxated. Some time ago, I was called to a lady, who, in looking over her bed-room window three stories high, between thirty and forty feet in height, lost her balance, and fell on a large washing-tub, her back striking the edge of the tub. Paralysis of the lower extremities, of the bladder of urine and the rectum continued for two months, when she died. On examination of the spine (the object in question, for it is foreign to my purpose to detail minutely the case), the last dorsal vertebra was found fractured, and the spinal canal obliterated. Mr. C. Bell relates an instance of a subluxation of the last cervical from the first dorsal vertebra, which, however, appears to have been produced by the suppuration more than by the injury. Desault, Petit-Radel, and Chopart, cite each a case, and Boyer talks of a number of examples of the luxation of one of the articular processes of a cervical vertebra, from that of the contiguous vertebra, from which resulted permanent rotation and inclination of the neck towards the side opposite to that of the luxation. In this accident, the position of the head and neck at once distinguishes it, and also the impossibility of turning

performed between the condyloid processes of the occipital bone, and the superior articular processes of the at-

the neck to the opposite side. From the elongation or laceration which would necessarily accrue to the spinal marrow, in any attempt to reduce this luxation, all idea of reducing it must be abandoned. Petit-Radel attempted reduction in a young child, which died in his arms. Desault and Chopart left their patients to nature, and they lived.

Boyer mentions, that in violent flexions of the spine, forwards or sternad, the interspinous ligaments and ligamenta subflava have been ruptured. When the former only were lacerated, no injury of the spinal marrow followed; but when the latter, paraplegia and death resulted.

The occipital condyles have never been displaced from the atlas by external violence, but occasionally by disease. Daubenton, Sandifort, Boyer, Duverney, Schupke, Frank, Rust, and Reil, detail cases of this last event. These arose from scrophulous affections, or caries, or exostosis of either the articular or transverse processes of the atlas, or from the existence of similar tumours on the occipital bone, or petrous portion of the temporal bone. The anterior or posterior portion of the bony ring, or one of the sides of the atlas, has been so pushed to one side, as to diminish the diameter of the foramen magnum a third, the half, and even two-thirds. Notwithstanding so great a displacement of the atlas, and consequent pressure on the spinal cord, individuals so affected have lived for many years, apparently from its taking place gradually, until these tumours have acquired either a prodigious magnitude, or the head has become anchylosed with several of the cervical vertebræ. In these cases, not only was the atlas displaced from the occipital bone, but anchylosis had taken place in the articulation between the processus dentatus and the atlas, and even between the point of the processus dentatus and the occipital bone. Other varieties of displacement and anchylosis were observable. The treatment of this peculiar affection consists in keeping the head and neck as straight as possible, by means of the chin-stay, and in applying blisters, or setons, or issues: only an eschar should be made, and probably the moxa is the best means to produce this.

The vertebra dentata has been displaced from the atlas, particularly its processus dentatus, and this has occurred both from external violence and from disease, and has generally proved very soon fatal. The external violence has in some cases been extremely trifling; thus Petit details a case wherein the lifting a child up by the head produced it, and Mr. C. Bell relates also a case where a man hurling a wheel-barrow forcibly from the causeway upon the pavement, fell upon his chin, and ruptured the transverse, lateral, and perpendicular ligaments. Boyer imagines, that in some instances the perpendicular and lateral ligaments are ruptured, that the processus dentatus slips sacrad of the transverse ligament of the atlas, and that

las; while the rotatory motions of the head are performed between the inferior or sacral articular surfaces of the atlas, and the superior of the vertebra dentata, these latter motions being limited in their extent by the lateral ligaments of the dentata. In these last motions the processus dentatus is prevented pressing on the spinal cord by the transverse ligament of the atlas, and the perpendicular of the vertebra dentata, and also by the ligamentum commune anticum, which is sometimes named the circular ligament, and likewise by the theca vertebralis.

In the two last Parts, I described the minute anatomy of the brain, or sensorium commune, and in this I mean to describe the organs of sense, which are the instruments by which that sensorium becomes acquainted with external objects.

The senses are five in number, viz. seeing, hearing, smelling, tasting, and touch; of these I shall first describe that of smelling, next that of tasting, thirdly, that of hearing, fourthly, that of seeing, and lastly, that of touch; not that I think this the natural anatomical order, but that I am compelled to adopt it, in consequence of the difficulty of procuring perfectly fresh eyes.

I have here to regret, therefore, that owing to the above circumstance, all the plates of the eye are not yet engraved, because, in a naturally connected anatomical

this result happened in the case of a child related by Petit, and to the malefactors executed at Lyons, as detailed by Louis. In all the above cases from accident, death instantly ensued; but should such an event not immediately occur, the patient should be placed on his back, and the head and neck put in such a straight position, as to remove the pressure of the processus dentatus from the spinal cord. In displacement occurring from disease, the patient ought to be laid in the horizontal posture, the chin-stay applied, and eschars made with the moxa. An interesting case of this last is detailed in the 15th volume of the *Edin. Med. and Surg. Journ.* page 417.

order, the eye should be described as the first organ of sense, as some of its nerves proceed to the nose; this latter organ should come next; thirdly, the mouth; fourthly, the ear; and lastly, the skin. In a physiological view of the senses, this order should be reversed. I have no alternative, therefore, but to begin with the nose. I am happy to say, that only one plate of the eye remains to be engraved, and that it is well advanced.

The nose is delineated in Plates V. and VI. of Part IX., and consists of bones, cartilages, a delicate mucous membrane, several cells, blood-vessels, nerves, and lymphatics. In Part I. page 58, several bones are described as entering into the formation of this organ of sense, viz. the nasal, the superior maxillary, the lacrymal, the frontal, the ethmoid, the sphenoid, the vomer, the inferior spongy, and the palate bones.

The septum narium, marked with the letters *c*, in *Figs.* 1 and 2 of Plate V., and in *Fig.* 1 of Plate VI., formed by the azygos process of the sphenoid, the spinous processes of the palate and superior maxillary, and the nasal lamella of the ethmoid bones, together with the vomer, is completed in the fresh state by an extension of cartilage, onwards to the tip of the nose, where there is also a loose or moveable piece of cartilage, appearing a continuation of the latter, which is covered with skin, studded with bristly hairs, and named columna, and marked D in the same figures. Between these cartilages a small elliptical depression is observable, represented in the plates by a slight shading.

On each side of the anterior aperture E of the nares, in *Fig.* 2 of Plate V., is placed an irregularly oblong shaped cartilage B, which forms the ala or pinna of the nose, and which is named the lateral cartilage. This is connected

by a ligamentous membrane C, to the nasal and superior maxillary bones, and to the columna D, and the perpendicular cartilage A. The perpendicular cartilage A, of a long roundish figure, extends from the longitudinal nasal suture, resting on the cartilaginous septum narium, to the columna D, on which it also rests; and, in some instances, appears merely a thickening or overlapping of the cartilaginous septum narium. This is named the dorsum of the nose, and the one extremity is termed the tip, apex, or point of the nose, and the other extremity, or rather the point where the nasal bones join the frontal bone, is styled the root or radix. At the back or inial part of the nares, we have two large apertures, one of which is marked T, in *Fig.* 1 of Plate V., leading to, or communicating with the pharynx b; and here there are also lateral cartilages, on one of which the letter T is placed. Besides these four large apertures to and from the nares, there are all those to the cells and cavities, and to the Eustachian tubes, one of the latter of which is marked z in this figure; and also the apertures to the lacrymal duct, indicated by the bristle 3. All these bones and cartilages are observed in the figures of Plates V. and VI., to be clothed with a delicate vascular mucous membrane,* having an infinite number of small mucous follicles, and on which the nerves of smelling are minutely and extensively ramified. This mucous membrane is a continuation of the cutis vera, beautifully modified for this higher order of function. Besides investing all the bones and cartilages of the nares, it extends into all the cells, cavities, and ducts, connected with the nares, becoming, however, much thinner and more delicate. These cells are delineated in *Figs.* 1 and 3

* Syn. Schneiderian membrane.

of Plate V., and in *Figs.* 1, 2, and 3, of Plate VI.; the frontal sinuses being marked *f*, the ethmoidal cells *f**, *f**, *f**, the palatine cell P, the sphenoidal cell *g*, and the antrum maxillare A. The bristle marked 3 in *Fig.* 3 of Plate V., and in *Figs.* 1 and 2 of Plate VI., is introduced along the lacrymal or nasal duct, showing its course from the nose upwards, or from the eye downwards to the nose, the latter being the natural course of this conduit for the tears from the eye to the nose. The aperture leading from the orbit is developed in Plate X. *Fig.* 2, marked G. This tube, as already mentioned, is formed by the lacrymal, superior maxillary, and inferior spongy bones, as illustrated in Plates IV. V. and VI. of Part I., and lined with a continuation of the mucous membrane of the nares. In *Fig.* 3 of Plate V. of Part IX., the inferior spongy bone is marked 23, and we observe the bristle 3 emerging from below this bone; in *Fig.* 1 of Plate VI. a considerable portion of this bone 23, has been removed to exhibit the course of this tube; while in *Fig.* 2 of the same Plate, this bone is still further cut up to display this passage. This lacrymal duct conducts the tears from the lacrymal sac at the inner canthus of the eye to the nares, from thence they glide along the floor of the nares, flow out at the posterior apertures T, *Fig.* 1 of Plate V., and down along the velum palati F, to the pharynx *b*, and œsophagus, into the stomach.* The mucous secretion from the extensive surface of the Schneiderian membrane of the nares flows along the same course to the stomach.

* The course of the lacrymal duct should be well understood, being subject to inflammation and diseased secretion, which sometimes ends in thickening of the membrane that closes up the channel, forming the disease named fistula lacrymalis. We sometimes require to introduce a probe, or syringe, into it, either from the nares, or from the eye.

The bristle marked 2 in *Fig.* 3 of Plate V., and in *Fig.* 1 of Plate VI., indicates the aperture or canal of communication of the frontal sinus with the nares. Both the sinus *f*, and its canal, are clearly developed in *Fig.* 2 of Plate VI., the channel being exposed.

The bristle marked 5, in *Fig.* 3 of Plate V., and in *Fig.* 1 of Plate VI., indicates the aperture which leads to the ethmoidal cells; all of which are laid open in *Fig.* 2 of Plate VI., aud where the centre one of the three is, they communicate individually with the nares. Sometimes they communicate directly, and sometimes through the medium of one another.

The bristle marked 7, in *Fig.* 1 of Plate VI., indicates the channel of communication to the palatine cell P, which is seen in *Fig.* 2 of Plate VI., and in *Fig.* 1 of Plate V. The bristle 4 in *Fig.* 3 of Plate V., and in *Fig.* 1 of Plate VI., indicates the mode of communication with the sphenoidal cell *g*.

The bristle marked 6, in *Fig.* 1 of Plate VI., indicates the aperture leading backwards to the antrum maxillare, which is situated between the superior and inferior spongy bones, as will be easily understood by comparing *Fig.* 3 of Plate V. with *Figs.* 1 and 2 of Plate VI., in the last of which figures the aperture is distinctly seen. In *Fig.* 3 of Plate VI., and in *Figs.* 1 and 3 of Plate V. this cavity is fully displayed. In *Fig.* 5 of Plate VI., the delicate mucous membrane, which invests this cavity, is displayed, the bone having been removed. All of these cavities, I have already mentioned, are invested with the mucous membrane of the nares, and all of them have small apertures or canals of communication, in order to prevent the cold atmospheric air being freely admitted.

The nares are supplied with blood by the internal maxillary artery, marked *f*, in Plate VII. of Part II., and

described in pages 46 and 47 of the same Part, and are extremely vascular, being, in health, of a bright red colour. The ophthalmic artery also contributes to supply the nares, giving origin to two small arteries, named ethmoidal, which enter at the foramina orbitaria interna, and are ramified on the ethmoid and other cells in their contiguity.

The nerves which are distributed on the nares, are the first pair or olfactory, the nasal twig of the ophthalmic or first branch of the fifth pair of nerves, and the nasal twigs of the second or superior maxillary branch of the same nerves.

The olfactory nerves, delineated in *Fig.* 7 of Plate VII., in Plates X. XI., *Fig.* 5 of Plate XII., and Plate XIII. of Parts VII. and VIII. of the brain, and marked with the digits 1, are described in page 28 of Part VIII. Their distribution on the mucous membrane investing the turbinated portions *d*, in *Fig.* 3 of Plate V. of Part IX., and the mesial septum *c*, in *Fig.* 1 of Plate V. of Part IX., is so soft and delicate as to be with difficulty depicted.

The fifth pair, or trigeminal nerves, are represented in *Fig.* 7 of Plate VII., and in Plates X. and XI. of Parts VII. and VIII., marked 5, and their origin described in page 31 of Part VIII.; but as the nasal twig of the ophthalmic branch is not seen in the Plates of Part IX., but in those of Part X., and as several other branches of this nerve are not seen in this Part, it appears preferable to defer its description, until I can do it in a connected methodical order. In the meanwhile, the reader is directed* to the nasal twigs which are given origin to by the palatine nerve, marked P, in *Figs.* 4 and 5 of Plate VI. of

* The names of the nervous twigs seen in *Figs.* 4 and 5 of Plate VI., are given in the Index of the Letters of Reference.

Part IX. In *Fig.* 5, where they are better seen, five nervous threads are observed to enter the nares at the spheno-palatine aperture (marked *o*, in *Fig.* 4 of Plate IV. of Part I.) These nervous threads are distributed on the mucous membrane investing the mouth of the Eustachian tube, the sphenoid and other cells contiguous, and the septum narium, while one of them descends along the septum to the foramen incisivum, which it perforates, and unites with twigs of the palatine nerve, marked P, in *Fig.* 1 of Plate VII. These nervous threads are named by some authors, the superior posterior nasal nerves, to distinguish them from other nasal nervous threads, termed the inferior posterior nasal nerves, which are represented in *Fig.* 5 of Plate VI., arising further down from the palatine nerve P, and which are piercing the nasal lamella of the palatine bone, to be distributed on the mucous membrane investing the inferior spongy bone and floor of the nares.*

* In Page 58 of Part I., some observations are made on the structure and configuration of the nares. From the great vascularity of the mucous membrane, and its exposed nature, hemorrhage or epistaxis is a frequent occurrence, but unless it happen in advanced life, it is seldom serious or dangerous. At this period, however, it should be carefully watched. If cold styptic lotions, as vinegar and cold water, or a solution of the sulphate of zinc or copper, have no effect, the posterior apertures require to be plugged up with lint, which is accomplished by introducing either a long-eyed probe (carrying the eye'd-end first), or a double canula armed with the noose of a ligature, along the floor of the nares, keeping close to the mesial septum, backwards to the pharynx, and downwards behind or dorsad to the velum palati, until the ligature is seen in the throat, when it is to be brought forwards by forceps into the mouth, and then have attached to it a dossil of lint, or piece of sponge, which is to be pulled upwards by the canula and ligature, into the posterior aperture of the naris, so as to shut it up. If the lint or sponge be too large or too small, it must be returned into the mouth and modified accordingly. The canula should then be removed, but the ligature left hanging out at the anterior aperture of the nares, which must be also stuffed with lint. The same steps are to be taken with regard to the other nostril. The patient will be able to breathe through the mouth.

I shall now proceed with the description of the organ of tasting, which may be said to reside in all the soft

Polypous growths frequently shoot from the superior spongy bones, and from every part of the mucous membrane of the nares. The distinctions of the various kinds of polypi, as adopted by Pott, appear, as the late Mr. J. Bell says, to be either unintelligible or nugatory, since they become malignant and fatal from the pressure they produce on the contiguous parts. For, "Polypus," as Mr. Bell justly observes, "is one of the most loathsome and fatal diseases. It is described in terms little suited to convey this idea to the young surgeon, who, while he reads a systematic author, or hears a lecturer talk in slight and familiar terms of the disease, and its cure, little suspects the dismal scenes which are passing in the chambers of the sick, and puts his hand, with little forethought or prudence, to operations the most difficult for a man of experience, the most impossible for an unskilful person to perform."

In all cases of polypi, where it can be accomplished, they should be removed by curved scissors, having blunt points. The forceps, in my opinion, should never be employed, as the scissors can always be used in their stead. The tumours should be seized with a hook or common forceps, which is to be held in the left hand, when the scissors, opened over the tumour, a limb being on each side of it, are to be carried along to the root, which is then to be cut across. The bleeding to be stemmed with lint, dipped in a solution of the nitrate of silver, which is to be applied by a probe, or director, or canula, and held there for a little. Where this line of practice cannot be pursued, the tumour should be removed by ligature. When ligatures are employed, that of catgut, or silver-wire, is applied, by means of a double canula; and this is the best remedy where polypi project and hang down the pharynx. After the tumour is removed either by the scissors or the ligature, the root of the polypus should be touched with caustic, or a small cautery, for several times, in order to stunt its growth. This application, particularly the caustic, produces severe irritation, and frequently requires the part to be soothed with injections of warm water. Caustic used as the sole means, is much too inefficient, and produces too much irritation. I have witnessed violent headach and smart fever induced by its application. The knife, either the common scalpel, or that recommended by Mr. John Bell, is exceedingly difficult of being applied. I have witnessed that great and dexterous surgeon even foiled in its application.

When polypi, or sarcomatous tumours, grow in the antrum, they either force their way into the nares, up into the orbit, or out towards the cheek, or in all these directions. "More frequently," says Mr. John Bell, "the upper jaw-bone is destroyed; the tumour makes its way into the antrum; the whole upper jaw-bone becomes carious; the teeth drop from their places; and a fœtid matter distils from their sockets; and the patient dies, wasted by pain and hæmorrhagy."

parts of the mouth, from the lips to the fauces. This, therefore, comprehends the whole of the mouth, which is

All the cases that have come within my own knowledge (with the exception of one), wherein these sarcomatous tumours have been removed by laying open the antrum, have either returned, or terminated fatally. I am therefore decidedly of opinion, that unless we remove the whole diseased surface, which can only be done by taking away the entire superior maxillary bone, we merely tamper with the disease, put our patient to excruciating suffering, and ultimately to death. The inferior maxillary bone has now been nearly entirely removed for osteo-sarcoma with success, and I see no difficulty in accomplishing the same with one of the superior maxillary. We secure the common carotid artery for other tumours of the face, and for aneurism by anastomosis, and why not do it for so loathsome and fatal a disease as this? The steps or plan of the operation I would suggest for so fatal a disease, are, first to secure the trunk of the common carotid artery of the affected side; next to make an incision through the cheek, from the angle of the mouth backwards or inaid to the masseter muscle, carefully avoiding the parotid duct, then to divide the lining membrane of the mouth, and to separate the soft parts from the bone upwards to the floor of the orbit; thirdly, to detach the half of the velum palati from the palate-bone. Having thus divested the bone to be removed of its soft coverings, the mesial incisive tooth of the affected side is to be removed; then the one superior maxillary bone to be separated from the other, at the mystachial and longitudinal palatine sutures, and also the one palate-bone from the other, at the same palatine suture, as the latter bone also will require to be removed either by the forceps of Mr. Liston, or a saw; thirdly, the nasal process of the superior maxillary bone should be cut across with the forceps; fourthly, its malar process, where it joins the cheek-bone; fifthly, the eye with its muscles and cellular cushion being carefully held up by a spatula, the floor of the orbit is to be cleared of its soft connexions, and the superior maxillary bone separated from the lacrymal and ethmoid bones with a strong scalpel. The only objects now holding the diseased mass, are the pterygoid processes of the sphenoid bone with the pterygoid muscles. These bony processes will readily yield by depressing or shaking the anterior part of the bone, or they may be divided by the forceps, and the muscles cut with the knife. The bone, or bones, are frequently so soft in this disease, as to be easily cut with a knife or scissors. After the bone with its diseased tumour has been removed, the flap is to be carefully replaced, and the wound in the cheek held together by one or two stitches, adhesive plaster and bandage. In no other way do I see that this formidable disease can be eradicated, and those who have had the misery to witness the exposure of the antrum by laying open the cheek, and the alternate cutting and cauterizing, and afterwards the protracted treatment by the cautery, the inflammation, the offensive suppuration, and the hectic fever which supervene, and ultimately carry off the patient, will listen to any means which

bounded by the lips anteriorly, the velum palati F, *f*, in *Figs.* 1 of Plates III. IV. and V. of Part IX., by the cheeks laterally, by the palate superiorly, and by the tongue and inferior maxilla inferiorly. All this surface is lined with a soft vascular mucous membrane, immediately beneath which a profusion of small mucous glands are situated. This mucous membrane is an extension of the cutis vera, modified to perform this other function, and is also covered by the cuticle. The osseous structure of the mouth is formed by the superior maxillary, the palate, and the inferior maxillary bones, together with the teeth. In *Fig.* 3 of Plate IV., the lips are everted, and several of the glands, which are named labial, are represented by a removal of the mucous membrane; these are marked *u* in the upper lip, and *l* in the lower lip; and in the red part of the lip, they are so small as to appear delicate villi. The frenum of the upper lip is marked *f*, and that of the lower lip f, and each of them is an extension of the mucous membrane with some degree of muscularity, which adheres to the alveolar processes, between the mesial incisive teeth. The glands, which are situated between the mucous membrane and the buccinator muscles, are precisely of the same order and nature, and are named buccal. Those on the palate, both on the hard marked v,

hold out a prospect of a happier result. Two formidable objections exist against the present mode of operating; the one is the exposure of the mucous surface of the antrum to the cold external air, which invariably inflames it, and frequently involves the whole face and head in erysipelas; the other is the leaving the roots of the disease: whereas in the operation proposed, only the small ethmoidal and palatine cells may be exposed, but not necessarily so, and even if exposed, they are only so for a few seconds, as they are speedily covered by the flap. Again, instead of being compelled to lay open the wounded antrum day after day, we at once cover the cut surface, and endeavour to heal it by the first intention, but if not, by suppuration.

in *Fig.* 1 of Plate IV., and on the soft palate F, are termed palatine.

The gums investing the alveolar processes on each side, and surrounding the neck of each tooth, to which they adhere, are formed of a compact interstitial substance, thick in consistence, and very vascular. They run into, or unite with, the mucous membrane and the periosteum.

The tongue, which is the chief organ of tasting, consists of muscles, glands, nerves, blood-vessels, and absorbents. The muscles have been already described.

In *Fig.* 1 of Plate IV., the tongue is represented *in situ*, and is described as having a root, which is connected by muscles with the os hyoides X, and epiglottis Q, as delineated in *Fig.* 2 of Plate VII., in which Plate other views of this organ are also depicted; as having a body or middle part of the tongue, an apex or tip A, a dorsum or convex surface D, two sides or margins S, and an inferior surface, extending from its middle to the apex, which has the frænum linguæ extending along it from the apex to the symphysis of the inferior maxillary bone. The lining mucous membrane of the mouth, of which the frænum is a doubling, surrounds the whole tongue, and connects loosely its sides to the inferior maxillary bone, so that we have here also a continuation or extension of the integuments; the cuticle being exceedingly thin, the corpus mucosum very thick and moist, and the cutis vera affording origin to the papillæ. On the upper surface, or dorsum, is seen a longitudinal line, named linea mediana, or middle groove, marked D, in *Fig.* 3 of Plate VII., at the commencement of which, near the root, is perceived a foramen, marked *h*, in *Fig.* 1 of Plate IV., and in *Fig.* 3 of Plate VII., named the foramen cœcum of Morgagni,

and there are observed a multiplicity of small glandular papillæ, which are arranged into three series, according to their magnitude. The largest series are observed to extend on each side from the foramen cœcum *h*, so as to form nearly a right angle, the apex pointing to the root, and the part of the root of the tongue posterior to this aperture to be studded over with them. In *Fig.* 1 of Plate IV., this angle approaches to the acute, while in *Fig.* 3 of Plate VII., it approximates an obtuse angle. This largest series of glands are of a lenticular form, are situated in shallow fossulæ, and have distinct little foramina in the centre of their apices. It is these glands which form the walls of the little foramen cœcum, together with some excretory ducts. This order of papillæ are denominated lenticulares, maximæ, capitatæ, or villosæ. Besides these papillæ lenticulares at the root of the tongue, there are a number of mucous lacunæ, or follicles. The second series of papillæ, less in size than the preceding, but larger than the next, are observed scattered over the dorsum at irregular intervals or distances, between the largest series and the apex. These are somewhat of a cylindrical figure, and are named papillæ semi-lenticulares, mediæ, or fungiformes. The third or smallest series of papillæ are observed to be interspersed all over the dorsal surface, are very minute conical points, and are named papillæ minimæ, conicæ, or villosæ.

The nerves which supply the tongue, are the glosso-pharyngeal, the gustatory branches of the inferior maxillary, and the lingual nerves. The glosso-pharyngeal nerve, marked 13, in *Figs.* 3 and 4 of Plate VII., and also in Plate VII. of Part II., is described in page 57 of the latter Part. The gustatory or lingual branch of the inferior maxillary nerve, marked 32, in the same figures and plates, is also described in Part II. page 61.

The lingual nerve, marked 3, in the same figures and plates, is likewise described in Part II. page 58.

The arteries which supply the tongue are the lingual and facial, described in Part II. pages 42, 43, and 44; and are delineated in Plates VII. VIII. and IX., the lingual being marked *b*, and the facial *c*.

Fig. 2 of Plate VII. is a vertical section of the tongue, illustrating its delicate glandular and muscular structure.*

* The lips, the gums, the cheeks, and the tongue, from their glandular structure, are very subject to malignant ulceration, to warty excrescences, to various kinds of tumours, and to cancer. The lower lip is more subject to cancer and warty excrescences than the upper lip; and when either of these occur, it should be removed together with a portion of the lip, in order to have healthy surfaces to unite, and to prevent a return of the disease. The best form of incision is that of the letter v, the apex pointing towards the chin; the part to be removed should be held firm with the fingers of the left hand, and excised with a common scalpel, making an incision first on the one side and then on the other. A piece of pasteboard, shaped to the gums, and inserted between them and the lower lip, will enable the operator to proceed with more freedom. When the part is excised, the coronary arteries bleed freely at first, but are immediately stemmed by approximating the raw edges by common needles mounted on a small piece of wood like a pencil, thrust first through the one side of the lip, and then the other; and when the needle has transfixed both sides of the wound, its wooden handle is to be removed, by cutting the thread which mounted it, and a long thick ligature of four or six threads is to be twined round both ends of the needle, in the form of the figure of 8. From two to three needles are required, according to the extent of the wound, and when they have all been inserted, the ligature may be entwined several times, in order to keep the edges perfectly approximated. Small pieces of lint should be put between the ends of the needles and the skin, to prevent them pricking the skin. The same steps are pursued when operating for harelip. The needles should be withdrawn on the third or fourth day. The common sewing-needle, as it is much smaller in circumference, is a preferable instrument to the harelip-pin. When tumours are seated on the gums, they frequently affect the bone, so as to require a portion of the latter to be removed. This is easily accomplished on the lower jaw-bone, from its narrowness and more insulated nature, but with more difficulty on the upper maxillary bone. The inferior is oftener the seat of tumours than the superior maxillary bone. When any bleeding occurs, it must be stemmed by

Before describing the ear, I cannot but regret the very little attention which is usually paid by medical men to

the actual cautery. Few or more of the teeth commonly require to be extracted.

Tumours of the cheeks, warty excrescences, and cancerous ulcerations, are very common affections, and one and all of them should be early removed with the knife, as they lay the foundation of loathsome incurable diseases. I have witnessed the smallest warty excrescence imaginable involve the whole face in deep painful cancerous ulceration, rendering the life of the individual most miserable for two or three years, when a little boldness on the part of the surgeon, and fortitude on that of the patient, would have eradicated the evil in a few seconds. In all operations of the face, we have to endeavour to avoid the parotid duct. (See Plate X. of Part II., letter x.)

The tongue is subject to tumours, to enlargement from mercury, and to cancerous ulceration. When tumours are present, they may be either removed by ligature or the knife, and as the latter produces less inflammation and pain, it is to be preferred, while the bleeding is to be arrested by the actual cautery. When the tongue is so enlarged as to prevent deglutition, or to threaten suffocation, which sometimes happens from the imprudent use of mercury, and occasionally in small-pox, free longitudinal incisions should be made; and when mercury is the cause, the medicine should be discontinued, and the patient exposed to change of air, have purgative glysters administered, and blood abstracted from the arm, if the incisions in the tongue do not bleed enough. In cancerous ulceration, either the ulcerated surface, or the whole tongue, should be excised with the scalpel, and if the latter be adopted, the lingual arteries should be secured in the first place, where they run above or atlantad to the cornu of the os hyoides, taking care to avoid the lingual nerves, which lie superficially to the arteries. These vessels are imbedded in the hyo-glossi muscles, (See Part II. Plates VII. and VIII., artery marked *b*, nerve 3, muscle *i*). When these lingual arteries have been secured, the operator excises the diseased tongue, and if hemorrhage still takes place, it will arise most probably from the submental branch of the facial artery, seen also in Plates VII. and VIII. of Part II. This may be secured by ligature, but if found impracticable, the actual cautery must be used. There are several instances on record, of this cancerous ulceration having been cured simply by honey, others by arsenic, while others again by hemlock. I must confess that I have not had the delight to witness such happy results. I have at present a patient under my care with an extensive cancerous ulceration of both the tongue and palate, which has been only existing for five months, and which at first was confined solely to a small part of the tongue, and which might have been easily removed, whereas now it is past all hopes of being cured.

this most important organ; and the reason assigned by them for this neglect is, that its mechanism is extremely complicated and little known, its physiology, and consequently its diseases, still less so, and that even if these latter were known, nothing could be done for their removal, at least in diseases situated in the internal ear. All this may be very true, but instead of deterring us from the study, I think that it ought to be a most powerful incentive to its prosecution. Had physicians, from the complicated structure of the heart, been satisfied that the circulation of the blood should never be discovered, most assuredly it never would; for great discoveries in physiology are never made by chance, but only by patient and persevering investigation, can we ever expect to arrive at the truth. If such, then, is the case, and if we are so defective in the physiology of the ear, the importance of the subject should surely stimulate us to a minute and careful study of its anatomy, as the only means by which its physiology and its diseases can be thoroughly understood.

As yet, certainly, we are unacquainted with any means of cure, when the disease is situated in the internal ear, investigation, however, I am convinced, may do much even here; but although it never should, still the knowledge of the anatomy and physiology of the whole will enable us to determine, with greater certainty, the exact part of the organ which is diseased.

Having made these few introductory remarks, I shall proceed at once to describe what is known of its anatomy.

This organ of sense is divided into three portions, the external, the middle, and the internal; all the views of which are represented in Plates VIII. and IX. of this Part, *Fig.* 16 of Plate VIII. being an enlarged view of

Fig. 6 of the same Plate; *Figs.* 2, 4, 6, 8, 10, 13, and 17 of Plate IX. being enlarged views of *Figs.* 1, 3, 5, 7, 9, and 12 of Plate IX. The enlarged views are only marked.

The external portion, or external ear consists of cartilage, ligaments, muscles, sebaceous glands, adipose substance and integuments.

The cartilage, marked A, is named the pinna, and forms the greater part of this external portion, as seen in *Fig.* 16 of Plate IX., where the lower pendulous fatty substance has been removed, which is represented in *Figs.* 1, 2, 3, 4, and 5 of Plate VIII., marked B, and termed the lobulus.

The pinna has several elevations and depressions, which are better understood in the perfect ear than in *Fig.* 16 of Plate IX., where nothing but this cartilage is present. The elevations are the helix, marked *a*, in *Figs.* 1, 2, 3, 4, and 5 of Plate VIII., and in *Fig.* 16 of Plate IX. the antihelix c, in *Figs.* 1, 2, and 5 of Plate VIII., and in *Fig.* 16 of Plate IX., the tragus *e*, and the antitragus *o*, represented in the same figures.

The helix, letters *a*, in *Figs.* 1, 2, 3, 4, and 5 of Plate VIII., and in *Fig.* 16 of Plate IX., forms the boundary of the pinna, running in an arched form, and being turned over, or partially overlapping the general pinna; it begins at the lobulus B, and runs round from behind forwards, descending into the cavity, named the concha C, which it partially divides into two. Within the concavity of this helix, there is naturally formed a groove or fossa, named fossa innominata, marked with the letters *i*, in *Figs.* 1, 2, and 5 of Plate VIII., and in *Fig.* 16 of Plate IX., and which also begins at the lobulus, and runs around, descending into the concha C.

Within the circle of the helix, the antihelix, marked c, is situated, which forms the brim or margin of the concha C, and commences near the antitragus *o*, ascending and dividing into two crura, marked *c*, *c*, in its course onwards to the fossa innominata *i*; the lower crus continuing to form the margin of the concha C. Between the crura *c*, *c*, of the antihelix, there is formed a depression, marked *n*, named fossa navicularis, or scapha, which communicates with the fossa innominata.

The tragus marked *e*, is that triangular looking portion of the pinna, situated anterior or glabellad to the concha C, which, from being studded with bristly hairs in advanced life, has got its appellation. It is partially separated from the helix by a fissure, marked x, and forms the exterior commencement of the cartilaginous portion of the auditory tube.

The antitragus *o*, is the triangular portion of the cartilaginous pinna, opposed to the tragus *e*, and is immediately above the lobulus B, forming the inferior margin of the concha C. A fissure, marked W, in *Fig.* 16 of Plate IX., is observed to separate this from the helix *a*.

The concha, marked C, in *Figs.* 1, 2, and 5 of Plate VIII., and in *Fig.* 16 of Plate IX., is the large irregularly shaped cavity, bounded by the tragus *e* anteriorly, the antitragus *o* inferiorly, the antihelix c, with its inferior crus *c*, posteriorly and superiorly, and also by the termination of the helix *a*. The floor of this cup is formed by the general cartilage, as observed in *Fig.* 4 of Plate VIII., which is an outer or posterior view of the external ear. The concha C leads directly to the meatus auditorius externus *m*, or the cartilaginous portion of the tube, which tubular portion, marked *p*, in *Fig.* 5 of Plate VIII., is laid open to show its extent, from the external aperture down to the

membrana tympani *r*. This cartilaginous portion *p*, is seen to be of some length, to have an oblique direction downwards and forwards, or basilad and glabellad, and to be fixed on the scabrous auditory process of the temporal bone, the osseous continuation of which is here also laid open downwards to the membrana tympani. This tubular portion of the ear has a number of ceruminous glands situated within it, and is also studded with delicate hairs.*

On looking at the outer or posterior aspect of the pinna, we observe several fossæ, as delineated in *Fig.* 4 of Plate VIII., which are evidently the depressions formed by the elevations on the anterior aspect. The fissures between the portions of the pinna are, one between the helix *a*, and tragus *e*, as delineated in *Fig.* 16 of Plate IX., marked T, another between the helix *a*, and the antitragus *o*, marked W, and a third at the base of the tragus, marked X. Across these fissures there extend remarkably delicate ligaments, so delicate that they are scarcely capable of representation.

The muscles which operate on this cartilage are very numerous.

The levator vel attollens aurem,† delineated in Plate

* Its oblique direction and length should be well considered with regard to syringing the ear, when clogged up with hardened wax in a state of suppuration, and also when affected with polypus. When the last affection is present, the tumour should be laid hold of with a small hook, and gently elongated, and then a pair of delicate blunt pointed scissors are to be glided along the tumour to its pedicle or root, with which it is to be divided. Little or no bleeding follows, and to prevent or stunt the growth of the polypus, it should be touched with the nitrate of silver, for several days successively.

† Syn. Auriculæ primus: Primus propriorum auriculæ: Portio musculi frontalis supra crotaphitam ad aurem producti: Attollens auriculæ: Attollens auriculam: Superior auriculæ: Le premier de l'oreille: Le premier et le second mitoyen: Le muscle supérieur de l'oreille: Temporo-auriculaire: Temporo-conchinien.

X. of Part II., marked r; also in *Figs.* 1 and 2 of Plate VIII. of Part IX., is situated on the lateral aspect of the cranium, immediately beneath the integuments, with which it is very liable to be lifted up when displaying it. This muscle consists of a delicate assemblage of scattered muscular fibres, which originate from the expansive tendon of the occipito-frontalis muscle q, and descend to be inserted in the upper or coronal aspect of the back or dorsum of the cartilage, which forms the fossa navicularis, the fibres ascending upwards to the dorsum of the helix. The function of this muscle is to elevate the cartilage or pinna, upwards and forwards, or coronad and glabellad; and also to operate on the fossa navicularis.

The anterior auris muscle,* marked D, in *Figs.* 1 and 2 of Plate VIII. of Part IX., situated between the cheek-bone and the external cartilage of the ear, derives its origin from the zygomatic process W of the temporal bone, and after a short course, is inserted in a small eminence, marked *d*, in *Fig.* 16 of Plate IX., on the dorsum, or back part of the helix. Its function is to pull forwards or glabellad, and a little upwards or coronad, the external cartilage of the ear, and to widen or expand the fossa innominata.

The retrahens vel retrahentes auris muscle,† marked with the letters R, in *Fig.* 3 of Plate VIII., situated behind the external cartilage of the ear, consists of two or more fleshy slips, which originate from the mastoid pro-

* Syn. Auriculæ musculus anterior: L'antérieur de l'oreille: Musculus novus conchæ proprius: Prior auriculæ: Zigomato-oriculaire: Zigomato-conchinien.

† Syn. Secundus auriculæ: Secundus propriorum auriculæ: Proprius auris externæ: Le second de l'oreille: Retrahens auriculam: Posteriores auriculæ: Posteriores auriculæ et postici corrugatores: Tres retrahentes auriculæ: Le postérieur de l'oreille: Mastoïdo-oriculaire: Mastoïdo-conchinien.

cess of the temporal bone, superficially to the tendinous insertion of the sterno-cleido-mastoideus, and the origin of the posterior fleshy belly of the occipito-frontalis, and extend nearly horizontally, converging to a point, to be inserted in the dorsum of the cartilage forming the concha. Its function is to pull backwards or iniad the external cartilage, and to widen or expand the concha.

The helicis major muscle,* marked H, in *Fig.* 2 of Plate VIII. of Part IX., situated on the convex margin of the helix, where it runs round and down into the concha, is an extremely small muscle, which derives its origin from the helix within the concha, and ascends on its acute convex edge, nearly to its highest aspect, where it is lost. Its function is to depress that portion of the helix, in which it is inserted, and by this to dilate the fossa innominata. It may also elevate that portion of the helix, from which it arises, and hence also dilate the fossa innominata.

The helicis minor muscle,† marked *h*, in *Fig.* 2 of Plate VIII. of Part IX., is situated nearer the antihelix than the major, and derives its origin from nearly the acute margin of the helix within the concha, and ascends a shorter way along the flat exterior surface of the helix, on which its fibres are lost. Its function is to assist the helicis major.

The tragicus muscle,‡ marked T, in *Fig.* 2 of Plate VIII. of Part IX., is situated on the anterior and outer surface of the tragus *e*, from the root of which it arises, and ascends to be inserted in its apex. Its function is to

* Syn. Helicis musculus: Major helicis: Helix.

† Syn. Fibræ musculares in plana helicis facie: Minor helicis: Concho-helix.

‡ Syn. Musculus tragi: Concho-tragique.

pull the tragus forwards, and to widen or expand the concha C in that direction.

The antitragicus muscle,* marked *t*, in *Fig*. 2 of Plate VIII. of Part IX., situated on the antitragus *o*, derives its origin from the commencement of the antihelix c, and runs along the antitragus *o* to its apex. Its function is to pull the antitragus backwards or iniad, so as to widen or expand the concha C, in that direction. It may also pull the antihelix to the antitragus, so as to raise up that portion of the margin of the concha.

The transversus auris muscle,† marked U, in *Fig*. 4 of Plate VIII., situated on the dorsum of the external cartilage of the ear, is a scattered assemblage of muscular fibres, deriving their origin from the superior or coronal aspect of that portion which forms the concha, and passing across the fossa made by the antihelix, they are inserted in the dorsum of the helix. Its function is to pull backwards and downwards the helix and antihelix, and thus to dilate and expand the fossa innominata and navicularis. It will also raise the acute margin of the helix, so as to open the fossa innominata.

This external cartilage, with its muscles, has a number of sebaceous glands imbedded in the integuments investing it, the secretion of which is best exemplified in the fossa innominata, where from inattention it frequently becomes vitiated.

After the description of the external, I shall proceed to that of the middle portion of the ear, which consists of the tympanum, mastoid cells, and Eustachian tube, the tympanic cavity being represented in *Figs*. 6, 9, and

* Syn. Musculus antitragi: Antheli-tragique.

† Syn. Sunt fibræ transversæ in gibbo auriculæ: Fibræ, quæ in convexa conchæ parte: Transversus auriculæ: Concho-anthelix.

16 of Plate VIII., marked t, the mastoid cells m, and the Eustachian tube Z, in *Fig*. 5 of the same Plate. *Fig*. 16 is an enlarged view of *Fig*. 6.

The tympanic cavity t, *Figs*. 6 and 16 of Plate VIII., of an irregular circular figure, is bounded outwardly or peripherad by the membrana tympani *r*, *Fig*. 5 of Plate VIII., and in *Figs*. 1, 2, 3, and 4 of Plate IX. It is bounded inwards or centrad by an osseous partition between it and the vestibular cavity, which is seen in *Fig*. 6 and 16 of Plate VIII., having the foramen ovale o, and the foramen rotundum r, formed in it, which, in the recent state, are filled up by the extension of delicate membranes, and are then named fenestræ; it is bounded on its anterior or glabello-basilar aspect, with bone, but having a free communication with the posterior aperture of the nares and pharynx, through the medium of the Eustachian tube z, in *Fig*. 5 of Plate VIII.; and it is bounded on its posterior or inial aspect also by bone, having a free communication with the mastoid cells m, *Fig*. 6 of Plate VIII. This tympanic cavity is invested with a delicate mucous membrane, which may be said to be a continuation of that of the nares and pharynx, extending along the Eustachian tube, and in this cavity are contained the ossicula auditus, as represented in *Fig*. 7 of Plate VIII., and in *Figs*. 1, 2, 3, 4, 5, and 6 of Plate IX.

The membrana tympani *r*, *Figs*. 5 and 8 of Plate VIII., and *Figs*. 1, 2, 3, and 4 of Plate IX., situated obliquely at the bottom of the auditory tube, and forming the outer or peripheral wall of the tympanic cavity, adheres to a delicate projecting ring of the bone, of an oval circular shape, marked *a*, in *Fig*. 8 of Plate VIII., and consists of two laminæ, or membranes, the one being an extension of the cuticle from the auditory tube, the other an extension of the mucous membrane or perios-

teum, which invests the tympanic cavity. In early life it is beautifully radiated and very vascular, as represented in *Fig.* 8 of Plate VIII.; and in the fetal condition, there is an adventitious membrane exterior to the membrana tympani, named membrana mucosa, which on investigation is found to consist of two layers united at their margins, so as to constitute a membranous pouch, containing a whitish coloured flaky fluid. To the membrana tympani, the handle 5 of the malleus is attached. *Figs.* 8 and 7 of Plate VIII. are interior or central views, and therefore the handle is marked, while *Fig.* 5 of Plate VIII., and *Figs.* 1, 2, 3, and 4 of Plate IX. are exterior or peripheral views of the membrane, where the handle of the bone only shines through, and is therefore not marked. The other long process seen running parallel with the handle of the malleus, in some of these figures, is the long crus of the incus, which does not adhere to the membrane, and is consequently more faintly drawn.*

The anterior or glabello-basilar wall is extremely short or low, and has the Eustachian tube z opening into it. This tube is partly osseous and partly cartilaginous, as best illustrated in *Figs.* 1 and 2 of Plate IX., the small roman z, being placed on the cartilaginous portion, while the roman

* The situation, connexion, and obliquity of the membrana tympani, require to be considered by the operator, as it is sometimes requisite to pierce it for deafness. This can only be requisite when the membrane is exceedingly thickened from disease, or the Eustachian tube obstructed by disease, or when both occur. This little delicate operation may be performed, either simply with a stilet, curved to the shape of the auditory tube, or with a trocar and canula of the same shape; the latter is the preferable instrument, and should be cautiously introduced, having the trocar sheathed in the canula, till the latter meets with resistance from the membrane, which is known by the yielding springing resistance felt, and then the trocar is to be pushed along the canula to puncture the membrane. The loud sound felt by the patient informs the operator that he has succeeded.

capital Z, is placed on the osseous, the outer wall of which is necessarily broken up. The same roman capital is used in the mere osseous preparations of *Figs.* 6 and 7 of Plate VIII. This tube begins small in the tympanum, and gradually swells in diameter, till its termination at the posterior aperture of the nares, as seen in *Fig.* 1 of Plate V.; and in this course is attached to the basilar surface of the petrous portion of the temporal bone. The cartilaginous portion is very delicate in some points; and the whole tube is lined with a mucous membrane, which may be said to be the continuation of that of the nares and pharynx.* In the osseous state, there is another tube opening into the tympanic cavity, viz. the semi-osseous canal of the tensor tympani muscle, marked 1**, in *Figs.* 6 and 16. This tube is also indicated by the bristle marked 1, in *Fig.* 6 of Plate VIII., and is distinguished from that of the Eustachian tube, by being a degree smaller in calibre, and more centrad and coronad, or internal. On looking along the petrous portion into the tympanum, at these two canals, we observe only a delicate osseous lamina, partially separating them, for they communicate superiorly and laterally, or corono-laterad, the bone forming one arch over the two. In the recent state, the tensor tympani muscle, marked q, in *Figs.* 1 and 2 of Plate IX., at once indicates it.

The posterior wall of this tympanic cavity is equally as short or low as the anterior, and has a large aperture,

* When the Eustachian tube is inflamed, it should be treated by inhaling the vapour of hot water, or by inserting a tube along the nares, into its aperture in the pharynx, and having fitted a syringe to this tube, by injecting warm water into the Eustachian trumpet. The same means should be employed when this tube is obstructed; or a probe may be introduced from the nares along it.

which leads directly to the mastoid cells m. In *Fig.* 6 of Plate VIII., the small osseous bridge, which forms this aperture, is left, while in *Fig.* 7 of the same Plate, it is removed, the mastoid cells and tympanic cavity being thrown into one. These cells vary very much in different crania, some being large and few in number, while others are small and numerous: the latter of which is the case in *Fig.* 1 of Plate IX. They are lined with the mucous membrane common to the tympanic cavity and Eustachian tube.*

In the osseous state, there are many objects on the central or inner wall, or bottom of the tympanic cavity; the foramen ovale marked o, in *Fig.* 6 and 16 of Plate VIII., situated nearly in the centre, leads directly into the vestibular cavity; but in the recent state it is filled up with a membrane, an extension of the vascular periosteum, or mucous membrane of the cavity, and to the tympanic aspect of this membrane, now named fenestra, the base *w*, of the stapes one of the ossicula auditus is fixed. This bone is represented *in situ*, in *Fig.* 9 of Plate VIII., and in *Figs.* 9 and 10 of Plate IX.

The foramen rotundum r, which leads from the tympanum into the tympanic scala of the cochlea, is situated immediately beneath or basilad, and nearer the entrance to the mastoid cells, as represented in *Fig.* 6 and 16 of Plate VIII., and in *Figs.* 9, 10, 12, and 13 of Plate IX. This, like the foramen ovale, has an extension of the vascular periosteum, or mucous membrane of the tympanum, stretched to its margin, so as to form a fenestra.

Close to the inial or posterior elliptical margin of the fora-

* The mucous membrane of the mastoid cells is subject to inflammation and suppuration, particularly in early life; and when an abscess is ascertained, the matter must be evacuated, by making a crucial incision over the mastoid process, applying a small trephine, and giving exit to the matter.

men ovale, and nearer the mastoid cells than the latter, the osseous hollow pyramid, marked p, in *Figs.* 6, 9, and 16 of Plate VIII., and in *Figs.* 7, 8, 9, and 10 of Plate IX. is situated. This gives exit to the stapedius muscle, marked s, in *Figs.* 9 and 10 of Plate IX., and to the chorda tympani nerve marked 33, in *Figs.* 7, 8, 5, and 6 of Plate IX. In *Fig.* 6 of Plate VIII. a bristle, marked 2, is inserted in the Fallopian aqueduct A, and brought out at the osseous pyramid p, to show the manner in which the facial nerve runs this length, and gives origin to the chorda tympani twig. This Fallopian aqueduct, or canal A, in its course exterior to the central wall of the tympanum, makes a slight elevation immediately above, or coronad of the foramen ovale, and as this canal lodges the facial nerve, its course and manner of elevation are better understood by comparing *Figs.* 6 and 16 of Plate VIII. with *Figs.* 9 and 10 of Plate IX., where the facial nerve is marked 44. In *Fig.* 16 of Plate VIII., a bristle marked 2, is inserted in this aqueduct, at the foramen stylo-mastoideum, and two dotted lines are drawn in continuation; the one marked 33, proceeds to the pyramid p, while the other, marked A, indicates the course of the facial nerve. Precisely above, or coronad and somewhat iniad, near the beginning of the passage to the mastoid cells, a small protuberance marked *c*, in *Fig.* 16 of Plate VIII., is seen, which is made by the external or horizontal semicircular canal. This elevation will be better understood by comparing *Fig.* 16 of Plate VIII., with *Figs.* 9 and 10 of Plate IX., where *c* indicates the canal.

Between the foramen ovale and rotundum, there is an elevation observable, named the promontory, marked *a*, in *Fig.* 16 of Plate VIII., which is caused by the vestibular cavity and the commencement of the cochlea.

This elevation will be more easily comprehended by comparing this figure of Plate VIII. with *Fig.* 12 of Plate IX., where C indicates the cochlea, and V the vestibule.

Within this tympanic cavity are contained the ossicula auditus, the malleus, the incus, and the stapes. These are represented *in situ*, in *Figs.* 7 and 8 of Plate VIII., and in *Figs.* 1, 2, 3, 4, 5, 6, and 15 of Plate IX., and separately in Plate VIII., where *Figs.* 11 and 12 indicate the malleus, 13 and 14 the incus, and 15 the stapes.

The malleus, (*Figs.* 11 and 12 of Plate VIII., *Fig.* 11 being an internal or central view, and 12 an external or peripheral view, and both being bones belonging to the right side), is situated in the tympanic cavity, having some faint resemblance to a hammer, and is described as having a head, marked 1*, a cervix 2, a long slender process 3, a short process 4, and a handle 5. The head has a double articulating surface, with a slight depression or groove dividing it, by which it is joined to the body 6* of the incus. In the cervix, near the short process, the laxator tympani minor muscle, marked l, in *Figs.* 3 and 4 of Plate IX., is inserted. The long slender process 3, rests in the fissure of Glasserus, and in it is inserted the laxator tympani major muscle, marked L in *Figs.* 1 and 2 of Plate IX. In the handle of the bone, near this long slender process, is inserted the tensor tympani muscle, marked q, in *Figs.* 1, 2, 3, 4, and 15 of Plate IX. The short process itself adheres to the membrana tympani. The handle 5 of the malleus, adheres to the membrana tympani *r*, as represented in *Fig.* 8 of Plate VIII., and in *Figs.* 1, 2, 3, 4, and 16 of Plate IX. The malleus is hollow like the long cylindrical bones.

The incus, *Figs.* 13 and 14 of Plate VIII., the former being an internal or central view, and the latter, or 14,

an external or peripheral view, and belonging to the right ear, is situated within the tympanic cavity, and consists of a body 6*, a long crus 8, and a short crus 7*. The body has an articular surface to correspond with that of the head of the malleus, with which it is connected by a delicate capsular ligament. The short crus 7*, rests in the aperture leading to the mastoid cells, as represented in *Figs.* 7 and 8 of Plate VIII., and in *Figs.* 3, 4, 5, 6, and 15 of Plate IX., and its long crus 8 runs somewhat parallel to the handle of the malleus, downwards and inwards, or basilad and centrad, in the tympanic cavity, as delineated in *Figs.* 3, 4, 5, and 6 of Plate IX., its extremity giving rest to the apex 17 of the stapes, as seen in *Fig.* 8 of Plate VIII. This end or small projection of the long crus of the incus, is considered by some anatomists as a distinct bone, and named os orbiculare. The incus is hollow internally.

The stapes, *Fig.* 15 in Plate VIII., situated in the cavity of the tympanum, consists of a base, marked *w*, which corresponds in shape with the foramen ovale, the upper or coronal edge or margin being semicircular, while the lower or basilar is nearly straight, and is attached to the fenestra ovalis, as represented in *Fig.* 9 of Plate VIII., and in *Figs.* 9 and 10 of Plate IX.; it consists of two crura, a long one 10, looking backwards to the mastoid cells, and more curved than the short one 9, which looks forwards to the Eustachian tube. Both the crura and the base are slightly grooved, to receive a delicate membrane, named the membrane of the stapes, which is attached within their arch, as represented in *Fig.* 15 of Plate VIII., marked 18. This bone also consists of an apex or head 17, resting on the extremity of the long crus of the incus, as depicted in *Fig.* 8 of Plate VIII. To either the long posterior crus or the apex, the stapedius muscle s, is at-

tached, as delineated in *Figs.* 9 and 10 of Plate IX. The manner in which these ossicula auditus are joined or articulated to each other, is best represented in *Fig.* 8 of Plate VIII., this being a drawing of the fetal temporal bone.*

To enable these little bones to perform their motions, there are four muscles attached to them, viz. the tensor tympani, the laxator tympani major, the laxator tympani minor, and the stapedius.

The tensor tympani muscle,† marked q, in *Figs.* 1, 2, 3, 4, 7, 8, and 15 of Plate IX., situated partly without and partly within the tympanic cavity, derives a broad and fleshy origin from the styloid process of the sphenoid bone, where the spinous artery of the dura mater enters the superior border of the cartilaginous extremity of the Eustachian tube, and runs backwards or iniad along the osseous portion of the tube, and in its own semi-osseous canal, where becoming tendinous, it enters the tympanic cavity running backwards to be inserted internally or centrad in the handle of the malleus, and on the aspect opposite to the membrana tympani, near its long process. When the muscle leaves its semi-osseous canal, marked 1**, in *Figs.* 1 and 2 of Plate IX., it makes a turn backwards into the tympanum: its course and insertion are distinctly seen in *Figs.* 7 and 8 of Plate IX., where the malleus and incus are thrown outwards and downwards, or peripherad and basilad. Its function is to pull the

* The ossicula auditus are occasionally discharged in suppuration of the mucous membrane lining the tympanic cavity, accompanied with ulceration of the membrana tympani.

† Syn. Musculus ossiculi malleo comparati: Musculus malleum ad incudem movens: Auris internæ secundus, qui ab osse cuneiformi prognatus: Alter internus et in concha latitans: Musculus internus auris: Internus mallei: Le second de ceux qui apartiennent au marteau, et l'externe: Musculus majoris processus: Le monogastrique: Le muscle interne de marteau: Salpingo-malléen: Auris membranarum tensor.

malleus and membrana tympani inwards or centrad, and thus render its external or peripheral surface concave. It pushes the stapes against the membrana fenestræ ovalis, diminishes the vestibular cavity, and thus tenses all the membranes of the labyrinth.

The laxator tympani major* muscle, marked L, in *Figs.* 1, 2, and 16 of Plate IX., situated partly without and partly within the tympanic cavity, derives a fleshy origin from the styloid process of the sphenoid bone, and runs backwards, and becoming tendinous it enters the tympanum at the fissure of Glasserus, to be inserted in the long slender process of the malleus, where the latter rests in this fissure. Its function is to pull the handle of the malleus forwards upwards and inwards, or glabellad coronad and centrad, and by this to tense the membrana tympani in these directions; and also to tense the other membranes inwards and forwards.

The laxator tympani minor† muscle, marked l, in *Figs.* 3 and 4 of Plate IX., situated at the superior or coronal aspect of the membrana tympani, lying in a fine duplicature of the periosteum of the tympanum, derives its origin from the superior, posterior, or corono-inial margin of the meatus auditorius externus, where the membrana tympani adheres to it, and descends forwards and outwards, or glabellad and peripherad, to be inserted in the neck of the malleus near its short process. Its function is to pull the handle of the malleus backwards, upwards, and inwards, or iniad, coronad, and centrad, and thus to tense the

* Syn. Auris internæ externus: Externus mallei: Externus auris vel laxator externus: Musculus processus minoris mallei: Le muscle externe ou superieur du marteau: Acoustico-malléen: Auris membranarum in anteriora et interiora tendens.

† Syn. Auris membranarum in posteriora et interiora tendens.

membrana tympani in these directions, and also to tense all the membranes backwards and inwards, or iniad and centrad.

The stapedius muscle,* marked s, in *Figs.* 9 and 10 of Plate IX., situated in the posterior aspect of the tympanic cavity, arises by two origins, the one within the Fallopian aqueduct, the other from the hollow osseous pyramid of the tympanum; these uniting, run forwards and inwards, or glabellad and centrad, to be inserted in the posterior or inial aspect of the apex or head of the stapes, and sometimes in the posterior crus of this bone. Its function is to pull the apex or head of the stapes outwards and backwards, or peripherad and iniad, and thus to relax the membrana tympani, and membrana fenestræ ovalis, and also to enlarge the vestibular cavity, and relax all the membranes of the labyrinth.

I shall now proceed to the description of the proper internal portion of the ear, or what is named the labyrinth, which is divided into the vestibulum, the three semicircular canals, and the cochlea. These three portions are represented *in situ*, in *Fig.* 7 of Plate VIII., and in connexion with each other, but removed from the temporal bone in *Fig.* 10 of the same Plate; and also in *Figs.* 12, 13, and 15 of Plate IX., the cochlea being marked C, the vestibule v, and the three semicircular canals, *c*, *p*, *o*.

We observe in *Fig.* 6 of Plate VIII., in the dry osseous state, when the stapes is removed, that the foramen ovale o leads directly into the vestibular cavity. The same is represented in *Fig.* 10 of the same Plate, the let-

* Syn. Le muscle de l'étrier: Musculus stapidis: Stapedis musculus: Stapidæus vel musculus stapedis: Le second muscle de l'oreille interne que nous appelons petit: Pyramido-stapidien: Auris membranarum laxator.

ter v indicating the foramen ovale, which leads directly into the vestibule. When the stapes is left *in situ*, its base *w* shuts up this foramen, as represented in *Fig.* 9 of Plate VIII., and in *Figs.* 9 and 10 of Plate IX. When the partition between the tympanic and vestibular cavities, in which this foramen ovale is situated, is removed, and the vestibule laid open, as in *Figs.* 12, 13, and 17 of Plate IX., marked v, it is observed to be somewhat of an oval circular form, having several foramina opening into it. In these figures, particularly 13 and 17 of Plate IX., it is larger than in nature. This cavity is invested with its periosteum, within which is found a delicate pulpy membrane, a watery fluid, and the expansion of part of the auditory nerve. At the posterior or central wall, this nerve enters by a number of delicate filaments, which makes the dried bone have a sieve-like appearance, when held between the eye and the light, and therefore named macula cribrosa. The internal auditory foramen, by which the nerve enters, is immediately behind. This macula cribrosa is subdivided into two surfaces, which are named from their shape, cavitas semi-ovalis, marked *s*, in *Fig.* 17 of Plate IX., and cavitas hemispherica, marked *h*, in the same figure. A third cavitas is described by authors, named sulciformis, marked *f*, in the same figure, which is merely the commencement of the aqueduct of the vestibule, that is situated near the tubulus osseus communis, marked *p-o*, of the superior and posterior semicircular canals. This aqueduct of the vestibule proceeds through the bone, and opens about half an inch behind or iniad to the foramen auditorium internum in the adult, in a small pouch between the dura mater and the bone. The external aperture is marked K, in *Fig.* 14 of Plate IX. Contiguous to the cavitas semi-ovalis *s*, a small projection is seen, marked G, which is named the osseous pyramid of the vestibule. The cochlea

communicates with the anterior aspect of the vestibule, by a large aperture, as represented in *Figs.* 12 and 13 of Plate IX., marked *w**, and the three semicircular canals open or terminate by five apertures in the posterior aspect of the vestibule, as delineated in the same figures.

The three semicircular canals, marked *p*, *c*, and *o*, in *Figs.* 7 and 10 of Plate VIII., and in *Figs.* 3, 4, 5, 6, 7, 8, 9, 10, 12, 13, and 15 of Plate IX., are situated posteriorly or iniad to the vestibule, each forming nearly three-fourths of a circle, being remarkably equal in their circumference, having a gently waving or undulating appearance, and so placed as to catch every direction of sound; thus one of them, marked *p*, is placed superiorly or vertically, or across the petrous portion, its convexity constituting the most elevated point of this part of the bone, its edge being turned forwards, and is termed the superior or vertical canal; the one aperture is more expanded than the other, which expansion or dilatation is named the ampulla, marked P, in *Fig.* 13 of Plate IX.; its other extremity, or aperture, joins or communicates with one of the ends of the posterior or oblique canal *o*, forming the tubulus osseus communis, marked *p-o*, in the same figure. Another of these semicircular canals *o*, is placed perpendicularly oblique, so that its side is turned forwards, its one extremity joining the vertical canal *p* to form the tubulus osseus communis *p-o*, its other extremity being dilated to form its ampulla, marked O, in *Fig.* 13 of Plate IX.: this is styled the oblique or internal canal. The third canal *c*, is placed horizontally, and is named the horizontal or external, having its ampulla at its superior aperture, marked C, in *Fig.* 13 of Plate IX. This last is the least of the three semicircular canals. These semicircular canals are invested in the fresh state with their periosteum, within which is contained the same

watery fluid as in the vestibule, and a delicate pulpy membrane, on which is expanded part of the auditory nerve.

The cochlea, marked C, in *Figs.* 7 and 10 of Plate VIII., and in *Figs.* 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, and 15 of Plate IX., is situated anteriorly or glabellad to the vestibule v, having its base looking inwardly or centrad towards the foramen auditorium internum, which it touches, and its apex looking outwardly or peripherad towards the tympanum and Eustachian tube; it is a spiral volute of two gyri, or turns, and a half, formed by the petrous portion, and divided partially by a delicate semi-osseous lamina, that winds round a central pillar, as satisfactorily illustrated in *Fig.* 11 of Plate IX. In this figure, which is a magnified view, the letters C indicate the petrous portion forming the walls of this elegant little figure, which are observed to run towards the modiolus, or central pillar *m*, so as to constitute the osseous septum, which consists of two laminæ, and divides the gyri; those having an asterisk * after the C, point particularly to this septum. The letters *m* point out the central pillar, or modiolus, which extends from the base upwards to the middle of the second turn, and which consists of two thin laminæ, or plates, that are hollow and foraminular, in order to allow the delicate threads of the auditory nerve to pass through. The hollow tube of the modiolus is named the tractus foraminulosus. Around this modiolus *m*, winds the delicate lamina spiralis, or septum scalarum *l*, which commences at the base, and terminates at the apex, in a small hook-like point, named the hamulus laminæ spiralis *g*. This lamina, which is foraminular, and consists of two plates, divides the gyri, or turns, into two open tubes or scalæ, and therefore does not touch the sides or walls C, of the cochlea, in the dried state;

but in the fresh state this partition is completed, by an extension of a delicate pulpy membrane from this lamina *l*, to the walls C of the cochlea, which is termed the zona mollis, and upon it, as also the lamina spiralis, the delicate threads of the auditory nerve are expanded. These two tubes, or scalæ, the one of which commences at the foramen rotundum r, in *Fig.* 12 of Plate IX., is named the external, or tympanic; the other, termed the internal or vestibular, begins in the vestibule, as delineated in *Fig.* 13, marked *w**, and they both wind round the modiolus *m*, to the apex, where they communicate freely, through the medium of a small aperture under the hamulus *g*, styled the canalis scalarum communis, marked *h*. These scalæ are therefore of a conical shape. At the apex there is a small cavity, marked *i*, in *Fig.* 11, named the infundibulum, the base of which is formed by part of the walls of the cochlea, marked *a*, and termed the cupola, while the apex points to the apex of the modiolus. The foramen rotundum, like the ovale, has a membrane stretched across it, converting it into a fenestra. The cochlea is invested with its periosteum, and a delicate pulpy membrane. Within the tympanic scala, at its commencement, and near the foramen rotundum, a small fossa is perceived, named the sinus fenestræ rotundæ, marked t, in *Fig.* 17 of Plate IX., at the bottom of which is the internal opening of the aqueduct of the cochlea, which descends and opens within the cranium, immediately below the meatus auditorius internus. The external aperture is marked *k*, in *Fig.* 14 of Plate IX.

The internal auditory foramen, or meatus, is delineated in *Fig.* 14 of Plate IX., marked M, m, *b*, being a representation of it in the temporal bone of the right side. At the bottom of this meatus, an osseous ridge *b*, is observed to divide it in two portions or recesses. The

inferior M, when viewed between the eye and the light, is minutely cribriform, and is opposite the base of the cochlea and the vestibule, or actually forms the floor or base of the cochlea, and nearly the whole of the interior or posterior or central wall of the vestibule; here the auditory nerve enters, by dividing into numerous delicate and minute soft threads, the anterior fasciculus of which are distributed throughout the cochlea, by piercing the anterior or glabellar portion of the cribriform lamina, at the bottom of the meatus auditorius internus, and by ascending the hollow modiolus, or tractus foraminulosus, onwards to the pulpy membrane investing the infundibulum, and in this course piercing the minute foraminular structure, or canaliculi of the modiolus, and between the laminæ constituting the osseous septum, which divides the gyri, and also those of the lamina spiralis, to be distributed over the pulpy membrane investing the lamina spiralis, the cribriform structure of which enables them to be extensively distributed both over it and the zona mollis, and also over all the pulpy membrane investing the sides or walls of the scalæ. Plexiform expansions are formed over the lamina spiralis, and zona mollis. A delicate branch of this fasciculus proceeds laterally from the cochlea to the vestibule. Other threads of this nerve enter the vestibule through the foraminular plate, or maculæ cribrosæ of the cavitas semiovalis and sulciformis, to be distributed on the pulpy membranes of the vestibule and the three semicircular canals. These last threads constitute the posterior fasciculus which divides into three branches; the largest presents a gangliform swelling, pierces the macula cribrosa of the cavitas semiovalis, and supplies the posterior or central portion of the pulpy membrane investing the vestibule, which is named the alveus communis of the semicircular canals;

this portion also supplies the vertical and horizontal semicircular canals. The middle portion pierces the macula cribrosa of the cavitas hemispherica, to be distributed on the pulpy membrane of the vestibule. The smallest branch pierces the posterior part of the internal auditory foramen, and is distributed on the pulpy membrane investing the oblique canal. The origin of the auditory nerve is described in page 33 of Part VIII.

I have here deeply to regret the impossibility of procuring an ear fresh enough to give a representation of the beautiful distribution of the auditory nerve.

The superior recess m of the internal auditory meatus, has a distinct round foramen, which is the commencement of the Fallopian aqueduct, that gives passage to the facial nerve. Part of the course of this aqueduct is represented in *Fig.* 12 of Part IX., marked A, and another part in *Figs.* 6 and 16 of Plate VIII., also marked A, and in both of which is inserted a bristle marked 2. The facial nerve itself, however, is displayed in *Figs.* 9, 10, 8, 7, 4, 3, 2, and 1 of Plate IX., marked 44. In *Figs.* 9 and 10, it is observed running in its aqueduct between the vertical canal *p*, and the cochlea C, then between the horizontal canal *c*, and the stapes *w*, around the posterior or central wall of the tympanum, downwards in the bone, to emerge at the foramen stylo-mastoideum, the remainder or continuation of the nerve being described in page 62 of Part II. In the Fallopian aqueduct, the facial nerve is joined by the petrosal twig p of the vidian nerve *v*, as represented in *Figs.* 1 and 2 of Plate IX. This petrosal twig p is also observed in *Figs.* 1 and 2, to give origin to small threads, which supply one of the tympanic muscles, the tensor tympani q. As the facial nerve runs round the posterior wall of the tympanic cavity, it gives origin to a small twig, which is distributed to the tensor tympani muscle,

another to the stapedius muscle, and lastly to the chorda tympani, marked 33, in *Figs*. 5, 6, 7, and 8 of Plate IX., which emerges at the hollow osseous pyramid p of the tympanum, runs between the long crus 8 of the incus, and the handle 5 of the malleus, across the cavity, and emerges at the fissura Glasseri, and after a short course joins the gustatory branch 32 of the inferior maxillary nerve, as described in page 61 of Part II., and represented in Plate VII. of the same Part. In this course the chorda tympani sends off a twig to the laxator tympani major muscle L, in *Figs*. 1 and 2 of Plate IX. of Part IX.

INDEX

OF

THE LETTERS OF REFERENCE

IN

PART IX.

THE MUSCLES OF THE HEAD AND NECK, TOGETHER WITH THE ORGANS OF SENSE.

PLATE I.

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B, Insertion of sterno-hyoideus muscle
C, Insertion of sterno-thyroideus muscle
E, Insertion of sterno-cleido-mastoideus muscle
F, Constrictor pharyngis medius muscle
G, Stylo-hyoideus muscle
I, Œsophagus
K, Trachea
L, Longus colli muscle
R, Rectus anticus major muscle
W, Posterior head of digastric muscle
X, Os hyoides
Y, Constrictor pharyngis inferior muscle

a, Crico-thyroideus muscle
l, Masseter muscle
m, Stylo-glossus muscle
p, Splenius capitis et colli muscle

a, Zygomatic process of temporal bone
c, Capsular ligament of articulation of inferior maxillary bone
d, Angle of inferior maxillary bone

PLATE I. *(Continued.)*

e, Sternum
i, Hyo-glossus muscle
m, Mylo-hyoideus muscle
p, Pharynx
q, Styloid process of temporal bone
s, Lateral ligament of inferior maxillary bone
w, Anterior head of digastric muscle

25, Inferior maxillary bone
40, Levator scapulæ muscle

PLATE II.

B, Rectus capitis posticus major muscle
E, Insertion of sterno-cleido-mastoideus muscle
F*, Insertion of trachelo-mastoideus muscle
F, Constrictor pharyngis medius muscle
G, Origin of stylo-hyoideus muscle
H, Rectus lateralis muscle
L, Longus colli muscle
R, Rectus capitis anticus major muscle
W, Origin of posterior head of digastric muscle
X, Os hyoides
Y, Constrictor pharyngis inferior muscle

b, Mucous coat of pharynx
d, Transverse processes of cervical vertebræ
k, Stylo-pharyngeus muscle
m, Stylo-glossus muscle
n, Internal pterygoid muscle
t, External pterygoid muscle
u, Temporal muscle

a, Zygomatic process of temporal bone
b, Condyle of inferior maxillary bone
d, Angle of inferior maxillary bone
e, Capsular ligament of articulation of inferior maxillary bone
f, Internal pterygoid muscle
h, Interarticular cartilage of inferior maxillary joint
k, Genio-hyo-glossus muscle
l, Genio-hyoideus muscle
q, Styloid process of temporal bone
s, Cornu of thyroid cartilage
y, Constrictor pharyngis superior muscle

25, Inferior maxillary bone

PLATE III. *Fig.* 1.

A, Atlas
B, Tubercle at root of zygomatic process of temporal bone
C, Section of inferior maxillary bone
D, Palato-pharyngeus muscle
E, Rima glottidis
F, Velum palati
G, The tongue
H, Rectus capitis lateralis muscle
K, Trachea
L, Levator palati muscle
N, Cricoid cartilage
Q, Epiglottis
R, Insertion of rectus capitis anticus major muscle
R*, Vertebral artery
S, Thyroid cartilage
T, Posterior aperture of the nares
Y, Constrictor pharyngis inferior muscle

a, Circumflexus palati muscle
b, Mucous coat of pharynx
k, Insertion of stylo-pharyngeus muscle
m, Insertion of stylo-glossus muscle
n, Origin of internal pterygoid muscle
r, Rectus capitis anticus minor muscle
t, External pterygoid muscle

a, Zygomatic process of temporal bone
b, Condyle of inferior maxillary bone
c, Insertion of capsular ligament of inferior maxillary bone
d, Transverse process of atlas
e, Glenoid cavity of temporal bone
f, Uvula
k, Genio-hyo-glossus muscle
l, Unciform process of sphenoid bone
s, Superior cornu of thyroid cartilage
y, Constrictor pharyngis superior muscle

r, Inferior articular process of atlas

1, Transverse ligament of atlas

Fig. 2.

A, Atlas
C, Interarticular cartilage of vertebræ
D, Theca vertebralis
E, Ligamentum commune anticum vertebrarum
R, Vertebral artery

c, Capsules of articular processes of vertebræ
d, Vertebra dentata

a, Body of one of the vertebræ
b, Section of bony ring of vertebra

PLATE III. *Fig.* 2. (*Continued.*)

c, Articular process of vertebra
d, Transverse process of vertebra
i, Condyle of occipital bone
k, Foramen magnum
m, Anterior margin of foramen magnum
n, Tooth-like process of vertebra dentata
o, Vein joining lateral sinus

1, Transverse ligament of atlas
2, Lateral ligament of atlas
3, Perpendicular ligament
5, Occipital bone

PLATE IV. *Fig.* 1.

A, Tip of the tongue
B, Tubercle at root of zygomatic process of temporal bone
F, Velum palati
I, Œsophagus
K, Trachea
L, Levator palati muscle
N, Cricoid cartilage
Q, Epiglottis
S, Thyroid cartilage
T, Posterior aperture of the nares
V, Hard palate

a, Circumflexus palati muscle
b, Mucous coat of pharynx
s, Inferior cornu of thyroid cartilage

a, Zygomatic process of temporal bone
e, Glenoid cavity of temporal bone
f, Uvula
g, Thyro-arytenoideus muscle
h, Foramen cœcum of tongue
i, Condyle of occipital bone
k, Genio-hyo-glossus muscle
l, Unciform process of sphenoid bone
m, Crico-arytenoideus posticus muscle
n, Arytenoideus obliquus muscle
o, Foramen condyloideum posterius
p, Crico-arytenoideus lateralis muscle
q, Arytæno-epiglottideus muscle
r, Arytenoideus obliquus muscle
s, Superior cornu of thyroid cartilage
t, Arytenoideus transversus muscle
u, Azygos uvulæ muscle
x, Apex of arytenoid cartilage
z, External pterygoid process of sphenoid bone

1, Constrictor isthmi faucium muscle
3, Tonsil or amygdala

PLATE IV. *Fig.* 2.

A, The glottis
K, The trachea
N, The cricoid cartilage
Q, The epiglottis
S, The thyroid cartilage
X, The os hyoides

V, Ventricle of glottis

a, Vocal chord
b, Ligamentous band between arytenoid cartilage and epiglottis
c, Arytenoid cartilage
d, Ligament supporting epiglottis
e, Ligamentous band extending between os hyoides and thyroid cartilage
r, Membrane extending between os hyoides and thyroid cartilage
s, Superior cornu of thyroid cartilage
x, Cornu of os hyoides

Fig. 3.

N, The nose

f, Frenum of lower lip

f, Frenum of upper lip

i, Levator labii inferioris muscle
l, Glandular structure of lower lip
s, Depressor labii superioris muscle
u, Labial glands

PLATE V. *Fig.* 1.

A, Antrum maxillare
D, Columna nasi
F, Velum pendulum palati
G, Root of tongue
P, Palatine cell
Q, Epiglottis
T, Posterior aperture of nares
X, Bodies of cervical vertebræ
Y, Section of occipital bone
Z, Aperture to Eustachian tube
b, Mucous membrane of pharynx

b, Crista galli
c, Nasal lamella
*c**, Arytenoid cartilage
*f**, Ethmoidal cells
*g**, Section of cuneiform process of occipital bone
g, Sphenoidal cell

PLATE V. *Fig.* 1. (*Continued.*)

Fig. 2.

Fig. 3.

PLATE VI. *Fig.* 1.

PLATE VI. *Fig.* 1. (*Continued.*)

5, Probe introduced into ethmoidal cells
6, Probe introduced into antrum maxillare
7, Schneiderian membrane lining cavity of nares
23, Represents the surface where the inferior spongy bone has been detached

Fig. 2.

P, Palatine cell
f, Frontal sinus
*f**, Ethmoidal cells
g, Sphenoidal cell
3, Probe introduced into lacrymal duct
6, Foramen leading to antrum maxillare
23, Indicates the surface where the inferior spongy bone has been detached.

Fig. 3.

A, Antrum maxillare

Fig. 4.

P, Spheno-palatine branch of superior maxillary nerve
p, Palato-maxillary branch of superior maxillary nerve
c, Malar twig of superior maxillary nerve
d, Dental twigs of superior maxillary nerve
f, Uvula
l, Lacrymal twig of ophthalmic branch of fifth pair of nerves
v, Vidian branch of superior maxillary nerve
1, Ophthalmic branch of fifth pair of nerves
1*, Frontal twig of first branch of fifth pair of nerves
2, Infra-orbitary branch of superior maxillary nerve
2*, Superior maxillary branch of fifth pair of nerves
3, Inferior maxillary branch of fifth pair of nerves
5, Trunk of fifth pair of nerves

PLATE VI. *Fig.* 5.

A, Antrum maxillare
P, Spheno-palatine branch of superior maxillary nerve

a, Nervous twig distributed on antrum maxillare

v, Vidian branch of superior maxillary nerve

2, Infra-orbitary branch of superior maxillary nerve
2*, Superior maxillary nerve

PLATE VII. *Fig.* 1.

F, Velum pendulum palati
P, Palatine branch of superior maxillary nerve

V, Hard palate

f, Uvula

Fig. 2.

A, Apex of tongue
D, Dorsum of tongue
K, First ring of trachea
N, Cricoid cartilage
Q, Epiglottis
S, Thyroid cartilage
X, Body of os hyoides

S, Inferior cornu of thyroid cartilage

e, Round-shaped ligament extending between superior cornu of thyroid cartilage and cornu of os hyoides
r, Membranous ligament extending between os hyoides and thyroid cartilage
s, Superior cornu of thyroid cartilage
x, Cornu of os hyoides

Fig. 3.

A, Apex of tongue
D, Mesial line on dorsum of tongue
Q, Epiglottis
S, Side of tongue

h, Foramen cœcum of Morgagni

13, Glosso-pharyngeal nerve

PLATE VII. *Fig.* 4.

A, Apex of tongue
D, Dorsum of tongue

3, Lingual nerve

13, Glosso-pharyngeal nerve
32, Gustatory branch of inferior maxillary nerve

PLATE VIII. *Fig.* 1.

B, Lobulus
C, Concha
D, Anterior auris
H, Helicis major muscle
W, Zygomatic process of temporal bone

c, Antihelix
r, Attollens aurem muscle
s, Parotid gland

a, Helix
c, Crura of antihelix
e, Tragus
g, Temporal artery
h, Helicis minor muscle
i, Fossa innominata
m, Meatus auditorius externus
n, Fossa navicularis
o, Antitragus

Fig. 2.

B, Lobulus
C, Concha
D, Anterior auris
H, Helicis major muscle
T, Tragicus muscle
W, Zygomatic process of temporal bone

c, Antihelix
r, Attollens aurem muscle
s, Parotid gland

a, Antihelix
c, Crura of antihelix
e, Tragus
g, Temporal artery
h, Helicis minor muscle
i, Fossa innominata
m, Meatus auditorius externus
n, Fossa navicularis
o, Antitragus
t, Antitragicus muscle

PLATE VIII. *Fig.* 3.

B, Lobulus
R, Retrahentes auris muscle
a, Helix

Fig. 4.

B, Lobulus
U, Transversus auris muscle
a, Helix
p, Cartilaginous tube of external ear

Fig. 5.

B, Lobulus
C, Concha
W, Zygomatic process of temporal bone

c, Antihelix
z, Eustachian tube

a, Helix
c, Crura of antihelix
e, Tragus
i, Fossa innominata
m, Meatus auditorius externus
*m**, Mastoid process
n, Fossa navicularis
o, Antitragus
p, Cartilaginous portion of auditory tube
q, Styloid process
r, Membrana tympani

Fig. 6.

A, Fallopian aqueduct
w, Zygomatic process of temporal bone
z, Osseous portion of Eustachian tube

m*, Mastoid cells
o, Foramen ovale
p, Osseous pyramid of tympanum
r, Foramen rotundum
t, Tympanic cavity
a, Promontory of tympanum
c, Protuberance made by external semicircular canal

1**, Bristle indicating semi-osseous canal of tensor tympani muscle
2, Bristle indicating Fallopian aqueduct, and emergence of chorda tympani nerve

PLATE VIII. *Fig.* 7.

c, Cochlea
M, Inferior recess of meatus auditorius internus, which gives entrance to auditory nerve
v, Vestibule
z, Osseous portion of Eustachian tube

m, Commencement of Fallopian aqueduct
m*, Mastoid cells

b, Ridge dividing meatus auditorius internus

c, External or horizontal semicircular canal
o, Oblique or posterior semicircular canal
p, Vertical or superior semicircular canal
p-o, Union or tubulus osseus communis

1*, Head of malleus
3, Long slender process of malleus
5, Handle of malleus
6*, Body of incus
7*, Short crus of incus

Fig. 8.

a, Auditory ring of temporal bone
r, Membrana tympani
w, Base of stapes

1*, Head of malleus
3, Long slender process of malleus

5, Handle of malleus
6*, Body of incus
7*, Short crus of incus
8, Long crus of incus
9, Short anterior crus of stapes
10, Long posterior crus of stapes
17, Apex of stapes

Fig. 9.

p, Osseous pyramid of tympanum
r, Foramen rotundum

w, Base of stapes resting on foramen ovale

9, Short anterior crus of stapes
10, Long posterior crus of stapes
17, Apex of stapes

Fig. 10.

c, Cochlea
v, Vestibule

r, Foramen rotundum

c, External or horizontal semicircular canal
o, Oblique or posterior semicircular canal
p, Vertical or superior semicircular canal

PLATE VIII. *Fig.* 11. Malleus.

1*, Head of malleus
2, Cervix of malleus
3, Long slender process of malleus
4, Short process of malleus
5, Handle of malleus

Fig. 12. Malleus.

1*, Head of malleus
2, Cervix of malleus
3, Long slender process of malleus
4, Short process of malleus
5, Handle of malleus

Fig. 13. Incus.

6*, Body of incus
7*, Short crus of incus
8, Long crus of incus

Fig. 14. Incus.

6*, Body of incus
7*, Short crus of incus
8, Long crus of incus

Fig. 15. Stapes.

w, Base of stapes
9, Short anterior crus of stapes
10, Long posterior crus of stapes
17, Apex of stapes
18, Membrane of stapes

Fig. 16.

A, Fallopian aqueduct

o, Foramen ovale
p, Osseous pyramid of tympanum
r, Foramen rotundum

a, Promontory of tympanum
c, Elevation made by external semicircular canal
t, Boundary of tympanum

1**, Semi-osseous canal of tensor tympani muscle
2, Bristle inserted in Fallopian aqueduct
33, Dotted line, indicating course of chorda tympani nerve

PLATE IX. *Fig.* 1.

Z, Cartilaginous portion of Eustachian tube

44, Facial nerve

See Fig. 2.

Fig. 2.

L, Laxator tympani major muscle

P, Petrous portion of temporal bone, covered by dura mater

Z, Osseous portion of Eustachian tube

m*, Mastoid cells

p, Petrosal twig of vidian nerve

q, Tensor tympani muscle

q*, Tendon of tensor tympani muscle

z, Cartilaginous portion of Eustachian tube

m, Meatus auditorius externus

r, Membrana tympani

1*, Head of malleus

1**, Semi-osseous canal of tensor tympani muscle

4, Foramen ovale

44, Facial nerve

Fig. 3.

D, Petrous portion covered with dura mater

I, Twig of vidian nerve assisting to form the great intercostal nerve

p, Petrosal twig of vidian nerve

v, Vidian nerve

g, Cuneiform process of sphenoid bone

1, Nervus vagus

6, Sixth pair of nerves

7, Great intercostal nerve

12, Accessory nerve of Willis

19, Internal carotid artery

44, Facial nerve

See Fig. 4.

Fig. 4.

C, Cochlea

D, Petrous portion covered with dura mater

I, Twig of vidian nerve assisting to form the great intercostal nerve

PLATE IX. *Fig.* 4. (*Continued.*)

l, Laxator tympani minor muscle
m*, Mastoid cells
p, Petrosal twig of vidian nerve
q, Tensor tympani muscle
q*, Tendon of tensor tympani muscle

e, External or horizontal semicircular canal
m, Meatus auditorius externus
p, Superior or vertical semicircular canal
r, Membrana tympani
v, Vidian nerve

p, Cuneiform process of sphenoid bone

1*, Head of malleus
1**, Semi-osseous canal of tensor tympani muscle
3, Long slender process of malleus
6*, Body of incus
7*, Short crus of incus
8, Long crus of incus
44, Facial nerve

Fig. 5.

See Fig. 6.

Fig. 6.

C, Cochlea
D, Petrous portion invested with dura mater

m*, Mastoid cells

e, External or horizontal semicircular canal
m, Meatus auditorius externus
p, Superior or vertical semicircular canal

1*, Head of malleus
3, Long slender process of malleus
5, Handle of malleus
6*, Body of incus
7*, Short crus of incus
8, Long crus of incus
33, Chorda tympani nerve

Fig. 7.

See Fig. 8.

PLATE IX. *Fig.* 8.

c, Cochlea
D, Petrous portion invested with dura mater

p, Osseous pyramid of tympanum
q, Tensor tympani muscle
q*, Tendon of tensor tympani muscle

c, External or horizontal semicircular canal
p, Superior or vertical canal

1*, Head of malleus
3, Long process of malleus
6*, Body of incus
7*, Short crus of incus
8, Long crus of incus
33, Chorda tympani nerve
44, Facial nerve

Fig. 9.

See Fig. 10.

Fig. 10.

c, Cochlea
D, Petrous portion invested with dura mater

m*, Mastoid cells
p, Osseous pyramid of tympanum
r, Foramen rotundum
s, Stapedius muscle

c, External or horizontal semicircular canal

l, Lamina spiralis
p, Superior or vertical semicircular canal
w, Base of stapes resting on fenestra ovalis
*w**, Vestibular scala of cochlea

9, Anterior crus of stapes
10, Posterior crus of stapes
17, Apex of stapes
19, Internal carotid artery
44, Facial nerve

Fig. 11.

c, Base of cochlea
c*, Septum scalarum

a, Cupola
g, Hamulus

h, Canalis scalarum communis
i, Infundibulum
l, Lamina spiralis
m, Modiolus

PLATE IX. *Fig.* 12.

A, Aqueduct of Fallopius
C, Cochlea
V, Vestibule

r, Foramen rotundum

c, External or horizontal semicircular canal

l, Lamina spiralis
p, Vertical or superior semicircular canal
p-o, Tubulus osseus communis
*w**, Aperture leading from the vestibule to the cochlea

Fig. 13.

A, Aqueduct of Fallopius
C, Cochlea
V, Vestibule

r, Foramen rotundum

c, External or horizontal semicircular canal

l, Lamina spiralis
o, Oblique or posterior semicircular canal
p, Vertical or superior semicircular canal
p-o, Tubulus osseus communis
*w**, Aperture leading from the vestibule to the cochlea

Fig. 14.

K, External aperture of aqueduct of vestibule
M, Point of entrance for auditory nerve

m, Commencement of Fallopian aqueduct in meatus auditorius internus

b, Ridge dividing meatus auditorius internus
k, External aperture of aqueduct of cochlea

Fig. 15.

C, Cochlea
M, Meatus auditorius internus
V, Vestibule

q, Tensor tympani muscle

c, External or horizontal semicircular canal

PLATE IX. *Fig.* 15. (*Continued.*)

o, Oblique or posterior semicircular canal
p, Vertical or superior semicircular canal
1*, Head of malleus
6*, Body of incus
7*, Short crus of incus

Fig. 16.

A, Pinna
C, Concha
L, Laxator tympani major muscle
T, Fissure between helix and tragus
W, Fissure between helix and antitragus
X, Fissure at base of tragus
c, Antihelix
a, Helix
c, Crura of antihelix
d, Process of helix
e, Tragus
i, Fossa innominata
n, Fossa navicularis
o, Antitragus
r, Membrana tympani

Fig. 17.

C, Cochlea
G, Pyramid of vestibule
H, Cavitas hemispherica
V, Vestibule
c, External or horizontal semicircular canal
f, Aqueduct of vestibule
p, Vertical or superior semicircular canal
p-o, Tubulus osseus communis
s, Cavitas sulciformis
t, Aqueduct of cochlea

PLATE X. *Fig.* 1.

C, Caruncula lacrymalis
P, Plica semilunaris
S, Supercilium
T, Superior tarsus
t, Inferior tarsus
p, Punctum lacrymale

PLATE X. *Fig.* 2.

B, Nasal process of superior maxillary bone
G, Cavity of lacrymal sac
L, Levator palpebræ superioris muscle
O, Tendon of superior oblique muscle

W, Orbicularis palpebrarum muscle

b, Internal angular process of frontal bone
c, Cartilaginous pulley of superior oblique muscle
i, Inferior oblique muscle
l, Lacrymal sac
o, Membranous sheath of superior oblique muscle
p, Punctum lacrymale
q, Lacrymal gland
s, Corrugator supercilii muscle
t, Ligament of the tarsi

1, Bristle inserted in inferior canaliculus lacrymalis
2, Bristle inserted in superior canaliculus lacrymalis
13, Os nasi

Fig. 3.

D, Dura mater
G, Ganglion of Glasserus
L, Levator palpebræ superioris muscle
O, Superior oblique muscle
T, Superior tarsus

f, Frontal twig of ophthalmic branch of the fifth pair of nerves

a, Cribriform lamella of ethmoid bone
b, Crista galli
f, Frontal sinus
g, Sphenoid cell
l, Lacrymal twig of ophthalmic branch of the fifth pair of nerves
n, Nasal twig of ophthalmic branch of the fifth pair of nerves
p, Twig of frontal nerve, which supplies cartilaginous pulley of superior oblique muscle and lacrymal muscle
q, Lacrymal gland

*, Bristle inserted into canal of communication between frontal sinus and the nose

1, First or ophthalmic branch of the fifth pair of nerves
2, Optic nerve
2*, Second or superior maxillary branch of the fifth pair of nerves
3*, Third or inferior maxillary branch of the fifth pair of nerves
3, One of the third pair of nerves, or motor oculi
4, One of the fourth pair of nerves, or pathetic nerve
5, One of the fifth pair of nerves, or trigeminal nerve
6, One of the sixth pair of nerves, or abducens nerve
19, Internal carotid artery

PLATE X. *Fig.* 4.

A, Attollens vel levator oculi muscle
D, Dura mater
L, Levator palpebræ superioris muscle
O, Superior oblique muscle
T, Superior tarsus

a, Adductor oculi muscle
f, Frontal twig of ophthalmic branch of the fifth pair of nerves
g, Lenticular ganglion

a, Abductor oculi muscle
b, Crista galli
c, Cartilaginous pulley of superior oblique muscle
l, Lacrymal twig of ophthalmic branch of the fifth pair of nerves
n, Nasal twig of ophthalmic branch of the fifth pair of nerves
q, Lacrymal gland

1, First or ophthalmic branch of the fifth pair of nerves
2, One of the second pair, or optic nerves
2*, Second or superior maxillary branch of the fifth pair of nerves
3, One of the third pair of nerves, or motor oculi
3*, Third or inferior maxillary branch of the fifth pair of nerves
5, One of the fifth or trigeminal nerves
6, One of the sixth, or abducentes nerves
19, Internal carotid artery
20, Twig of the third pair of nerves distributed on levator palpebræ muscle

NOTICE.

The Author has intentionally left out the Surgical Remarks on the Eye, as he found them so voluminous, and involving so much of the Physiology of the Eye, that he has considered it preferable to give them hereafter. The description of the viscera of the thorax and abdomen will be given in Part XI., as the plates in Part X. do not embrace the whole of these organs.

PART X.

THE ORGANS OF SENSE, AND VISCERA OF THE THORAX AND ABDOMEN.

A

SYSTEM

OF

ANATOMICAL PLATES,

ACCOMPANIED WITH DESCRIPTIONS,

AND

PHYSIOLOGICAL, PATHOLOGICAL, AND SURGICAL

OBSERVATIONS.

BY

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PART X.—THE ORGANS OF SENSE, AND VISCERA OF THE
THORAX AND ABDOMEN.

EDINBURGH:
PRINTED FOR DANIEL LIZARS, 5 ST. DAVID STREET,
(LATE 61 PRINCES STREET);
S. HIGHLEY, 174 FLEET STREET, AND WEBB STREET, ST. THOMAS'S
HOSPITAL, LONDON; AND W. CURRY, JUN. AND CO.
9 UPPER SACKVILLE STREET, DUBLIN.
1826.

TO

ABRAHAM COLLES, Esquire,

PROFESSOR OF ANATOMY AND SURGERY IN THE ROYAL COLLEGE OF SURGEONS IN IRELAND,

IN ADMIRATION OF THOSE

DISTINGUISHED SURGICAL TALENTS,

WHICH HAVE

CONTRIBUTED TO RAISE THE MEDICAL SCHOOL OF DUBLIN

TO ITS PRESENT ELEVATION,

AND TO EXTEND ITS CELEBRITY OVER THE WORLD,

THIS PART IS INSCRIBED,

BY HIS VERY OBEDIENT AND VERY HUMBLE SERVANT,

THE AUTHOR.

CONTENTS.

ORGANS OF SENSE.

THE EYE.

In Plate X. of Part IX., and in Plates XI. and XII., this important organ is delineated. In order to simplify its description, the eye is divided into several departments, as the bones which compose the orbit, the external appendages, the eye-ball, the muscles, the nerves, and the blood-vessels. The orbits are of a conical figure, with their apices looking centrad or towards the brain, their bases peripherad or outwards, their internal or mesial sides running nearly parallel with each other, and their external or lateral sides divaricating.

The bones composing the orbit in which the eye and its appendages are contained, are the frontal, the lachrymal, the ethmoid, the superior maxillary, the malar, the sphenoid, and the palatine, making in all seven in number, as represented in *Fig.* 1 of Plate IV. of Part I. The orbit is invested with the periosteum, here named periorbita, which is continuous with the periosteum of the bones of the face, and with the dura mater that lines the interior of the bones of the cranium. The various foramina, as the optic, the anterior rugged or sphenoidal, the

spheno-maxillary, and the anterior and posterior internal orbitary, which give entrance to the different nerves and blood-vessels that supply the eye, are situated at the bottom of the orbit, as represented in *Fig.* 1 of Plate IV. of Part I.

The external appendages of the eye are, the supercilium, with its corrugator; the palpebræ, which consist of the common integuments, with very delicate cellular substance, the orbicularis palpebrārum, the tarsi, with their ligaments, and the tunica conjunctiva palpebrarum; the cilia; the glandulæ ciliares; the glandula lachrymalis; the caruncula lachrymalis; the lacus lachrymalis; the plica semilunaris; the puncta lachrymalia; the canaliculi lachrymales; the saccus lachrymalis, and the ductus lachrymalis.

The supercilium or eye-brow, marked S in *Fig* 1 of Plate X. of Part IX., is that elegant arrangement of hairs, situated on the integuments which cover the superciliary ridge of the frontal bone, forming an arch above the eye, and giving much expression to the countenance. These hairs are short, and consist of two series, the inferior of which runs upwards and outwards, while the superior downwards and outwards. Beneath the integuments there is a considerable quantity of adipose substance; and beneath this are the united fibres of the occipito-frontalis and orbicularis palpebrarum muscles; while underneath all, close to the pericranium, is the muscle which moves this arrangement of hairs, named corrugator supercilii.

The corrugator supercilii* muscle, represented in *Fig.* 2 of Plate X. of Part IX., marked *s*, situated on the superciliary ridge of the frontal bone, derives a fleshy

* Syn. Est qui sub cute supercilii: An pertinet ad supercilii musculum: Corrugator: Musculus frontalis verus, seu corrugator: Surcillier: Fronto-surcillier: Cutaneo-surcillier.

origin from the inner or mesial aspect, near the internal angular process, and extends along the ridge nearly two-thirds, when the fibres mingle with those of the orbicularis palpebrarum w, and the occipito-frontalis q muscles, so as to constitute its insertion. The function of this muscle is indicated by its name; it is employed in knitting or corrugating the eye-brows.

The palpebræ or eye-lids are each of a crescentic figure, or resemble the segment of a circle, the straight line of which forms the edge, so that when they are gently shut they form a complete circle. They are slightly convex outwardly, and gently concave inwardly, and are so adapted as to shut the anterior entrance of the orbit. Each palpebra consists of the common integuments, which are remarkably thin; of a little delicate cellular membrane, there being little or no adipose substance; of the fibres of the orbicularis palpebrarum muscle; of an oblong cartilage, named tarsus, which constitutes its chief portion; of cilia or eye-lashes; of ciliary glands; and of the tunica conjunctiva palpebræ.

The orbicularis palpebrarum has been already described in Part IX., page 36, and is delineated in Plate X. of Part II., marked w.

The tarsi are thin fibro-cartilaginous bodies, firm and elastic, of an oblong shape, broader in the centre than at the extremities, and thicker at their margins where they look to each other, being so constructed that their exterior or peripheral edges meet, while their interior or central edges are so far apart as to leave a triangular canal when the eye-lids are shut, and even when open an angular fossa at the margin of the lower eye-lid to conduct the tears. The tarsus forms the chief portion and strength of each eye-lid, on which the skin, the muscular fibres, and tunica conjunctiva, are stretched. The tarsus of

the upper eye-lid, marked T in *Fig.* 1 of Plate X. of Part IX., is larger and broader than that of the lower one, marked t in the same figure, both being invested, however, with the tunica conjunctiva, in consequence of their being everted. The inferior tarsus is not only narrower to correspond with its eye-lid, but is nearly of the same breadth throughout.* The tarsus of the upper eye-lid is supported in its situation by a ligamentous production, formed by the union of the periorbita and pericranium, which is attached to its orbital edge; while that of the lower eye-lid is supported by a similar production, formed by the union of the periorbita and periosteum, covering the superior maxillary and malar bones, and attached also to its orbital margin. These are named by some the broad ligaments of the tarsi, and are strongest at the outer or temporal canthus of the orbit. The two tarsi also have a ligament common to them, of a round shape, marked *t* in *Fig.* 2 of Plate X. of Part IX., extending from their inner or mesial extremities to the nasal process B of the superior maxillary bone.†

The cilia or eye-lashes are an elegant arrangement of stiff hairs, of a semicircular or arched shape, projecting from the outer edges of the margins of the eye-lids; those of the superior curving downwards and upwards, having their convexity looking downwards; while those of the inferior curve also downwards, but have their convexity pointing upwards, so that when asleep they interlace each other. The cilia of the upper eye-lid differ

* The shape of the tarsi should be thoroughly investigated, as the eye-lids are subject to many diseases, and require many operations. There are inversion or entropeon, eversion or ectropeon, and various tumours situated on the eye-lids, all of which generally demand an operation.

† Syn. Ligamentum palpebrale. The relation of this ligament to the lachrymal sac O, should be considered by the surgeon when operating for fistula lachrymalis.

from those of the lower in being longer and stronger, and in the central ones being also longer and stronger than those at the angles of the eye. Each eye-lash originates by a slender root from the integuments, becomes gradually thicker in the middle, and then tapers to a very fine point.*

The apertures of the ciliary glands,† or rather the ducts of these glands, which are placed on the inner surface of the tarsi, and covered by the tunica conjunctiva, are observable immediately within or centrad to the eye-lashes. The glands themselves are arranged transversely on the tarsi, as represented in *Fig.* 1 of Plate X. of Part IX., running in longitudinal parallel rows, or rather clusters, of a yellowish colour. When examined with a magnifying glass, each tube or row consists of a congeries of very minute roundish-shaped glands, each of which pours out its unctuous secreted fluid into its excretory tube, which runs in the centre of these small glands, and terminates by the open aperture at the ciliary margin of the eye-lid. These apertures are named the ciliary ducts. It is calculated that there are between thirty and forty rows of these small glands in the upper, and a few less in the lower eye-lid: in the former they are longer than in the latter.‡

The glandula lachrymalis, marked *q* in *Figs.* 2, 3, and 4 of Plate X. of Part IX., and in *Fig.* 1 of Plate XI. of Part X., situated at the outer and upper aspect of the

* The eye-lashes frequently take a different direction, and require an operation to be performed on the eye-lids; their natural course, therefore, should be well understood.

† Syn. Meibomian glands: Glandulæ sebaceæ palpebrarum.

‡ The ciliary glands are frequently diseased, and also lay the foundation of diseases of the contiguous organs; they are involved in ophthalmia of the conjunctiva palpebrarum, in psorophthalmy, in lippitudo, in hordeolum, in inflammation of the canaliculi lachrymales, of the lachrymal sac, and also in fistula lachrymalis.

orbit, near or within the external angular process of the frontal bone, adhering to the periorbita, (the depression being marked *k* in *Fig.* 2 of Plate V. of Part I.,) is a conglomerate gland of a somewhat oval shape, of a firm texture, and of a greyish ruddy colour, so that it is easily distinguished from the delicate soft adipose substance which abounds so plentifully in the orbit. Seven or eight short excretory ducts, leading from this gland, open like small lacunæ through the tunica conjunctiva palpebræ, and from which a few tears can be pressed when the eye is recent.* By some authors this gland is described as double, and named glandula lachrymalis superior seu innominata Galeni, and glandula lachrymalis inferior.

The caruncula lachrymalis, marked C in *Fig.* 1 of Plate X. of Part IX., situated at the inner angle of the eye, between the eye-lids, is a small conglomerate gland, of a reddish colour and prominent appearance, studded with short bristly hairs, and is more distinctly seen in the living than in the dead state. When examined in the latter state, it is found to be a congeries of glandular bodies, similar in structure to the ciliary glands.†

The lacus lachrymalis is a delicate channel or fossa, situated around the caruncle.

The plica semilunaris,‡ marked P in *Fig.* 1 of Plate X. of Part IX. is a delicate crescentic-shaped mucous membrane, situated a little nearer the eye-ball than the caruncula, the cornua pointing upwards and downwards, the convexity

* The lachrymal gland is seldom diseased; it is subject, however, to increased secretion, constituting epiphora; to inflammation, particularly the chronic, which occasionally terminates in schirrus and cancer; also occasionally to acute inflammation and suppuration, and to encysted lachrymal swelling, and to watery vesicle of the gland. It is likewise subject to other sarcomatous tumours.

† The caruncula lachrymalis is subject to inflammation, suppuration, abscess, encanthis, and pterygium.

‡ Syn. Troisième paupière.

towards the caruncle, and the concavity towards the cornea; it resembles the membrana nictitans in birds.*

A small aperture, marked *p* in *Fig.* 1 of Plate X. of Part IX., named the punctum lachrymale, is observable near the caruncula lachrymalis, on the margin of each eye-lid, at the extremity of the tarsus, with a slight elevation around, which is termed the papilla lachrymalis. Each punctum is the outer commencement of a slender little mucous tube, named canaliculus lachrymalis,† which leads into the lachrymal sac; and in *Fig.* 2 of Plate X. of Part IX., the bristles marked 1, 2, are inserted in these tubes, and seen converging and emerging from the sac G. The two canaliculi enter conjointly into the sac, or have a common inner opening, a tubulus communis, immediately beneath the ligament of the tarsi. Rosenmüller describes a little valvular fold covering this termination of the canals; but this I never could observe. The superior canaliculus runs more perpendicularly than the inferior, and both on a very gentle declivity, which, however, is modified by position, and each is about a quarter of an inch in length. The superior runs downwards and inwards, but the inferior is described by authors as running upwards and inwards.

The lachrymal sac G, situated at the nasal angle of the eye, and attached to the nasal process of the superior maxillary and lachrymal bones (see *Fig.* 1 of Plate IV. of Part I.), is a fibro-ligamentous pouch, of an oval shape, about the size of a small horse bean, lined with a pulpy mucous membrane, containing numerous small mucous cryptæ, and giving entrance to the canaliculi lachrymales, and forming the beginning of the lachrymal or nasal duct.

* The plica semilunaris is involved in the same diseases as the caruncula lachrymalis.

† Syn. Cornua limacum.

orbit, near or within the external angular pr
frontal bone, adhering to the periorbita, (t
being marked *k* in *Fig.* 2 of Plate V. of P
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wards the narrow part of the duct. This nasal duct,
therefore, is a narrow tube, having two large termina-
tions; the superior the lachrymal sac, and the inferior this
dilatation, where it ends in the naris.* About the middle
of the duct, a loose fold of the mucous membrane is de-

* The lachrymal passages, or the canaliculi, saccus, et ductus lachrymales, are subject to inflammation, to increased mucous secretion or blenorrhœa, vitiated secretion, stricture, fistula, hernia, and absolute obstruction; thus resembling the urethra in its diseases.

Soemmering as occurring in many subjects, s to be the result of disease.*

tigation of the appendages, I shall exa- the eye, which are divided into the ory; the former consisting of the retina, and the latter of the con- . I shall begin with the acces- with the tunica conjunctiva. the semi-pellucid mucous ce, which invests the eye- l of the eye. This mem- the eye which is ex- : the eye-lids being of the eye-lids T, , invests both eye-lids, us; and is reflected over the eye-ball, the caruncula lachrymalis, naris, so as to form a continuous or unin- surface. Its adhesion to these objects is cellular. here it begins to be reflected from the eye-lids, over the eye-ball, or vicê versâ, there is a doubling or loose fold or angle, which can be unfolded, so as to exhibit one extended smooth surface, by everting the ball of the eye out from the eye-lids. That portion of this membrane which invests the eye-lids is named tunica conjunctiva palpebrarum vel palpebralis, while that which covers the anterior aspect of the eye is termed tunica conjunctiva oculi, this latter being divided into conjunctiva corneæ and conjunctiva scleroticæ. Where the conjunctiva begins, it is pierced by the ciliary ducts; and where it passes over

* Where the lachrymal duct terminates in the nostril, stricture is said to occur most frequently.

† Syn. Tunica albuginea: Tunica adnata.

It is rounder superiorly than inferiorly, from its contracting to form the nasal duct, there being a slight constriction where the duct begins. This duct is formed of the lachrymal, superior maxillary, and inferior spongy bones, as described in page 53 of Part I., and delineated in *Fig.* 1 of Plate IV., and in *Figs.* 17, 16, 27, and 28 of Plate VI., and is lined with a pulpy mucous membrane continuous with the Schneiderian membrane of the nares, and with the tunica conjunctiva of the eye, and like the former containing numerous small mucous cryptæ; the mucous membrane lining the canaliculi and their puncta being, however, more compact and thinner. There is thus a connexion established between the eye and the nose by continuity of mucous surface through the medium of these lachrymal passages. In *Fig.* 3 of Plate V., and *Figs.* 1 and 2 of Plate VI. of Part IX., the course of this duct is developed. The bristle marked 3 in these figures, is inserted in this duct, and from these it is observed that the tube runs obliquely downwards and backwards. This duct is fully half an inch long, and sufficient to admit a bougie a little larger than a crow quill. *Fig.* 3 of Plate V. exhibits an interior section of the right naris, the digits 23 indicating the inferior spongy bone, which in *Fig.* 1 of Plate VI. is partially removed, and in *Fig.* 2 of the same Plate it is cut up towards the narrow part of the duct. This nasal duct, therefore, is a narrow tube, having two large terminations; the superior the lachrymal sac, and the inferior this dilatation, where it ends in the naris.* About the middle of the duct, a loose fold of the mucous membrane is de-

* The lachrymal passages, or the canaliculi, saccus, et ductus lachrymales, are subject to inflammation, to increased mucous secretion or blenorrhœa, vitiated secretion, stricture, fistula, hernia, and absolute obstruction; thus resembling the urethra in its diseases.

scribed by Soemmering as occurring in many subjects, but this appears to be the result of disease.*

After the investigation of the appendages, I shall examine the tunics of the eye, which are divided into the proper and the accessory; the former consisting of the sclerotic, choroid, and retina, and the latter of the conjunctiva, cornea, and iris. I shall begin with the accessory; and in the first place, with the tunica conjunctiva.

The tunica conjunctiva† is the semi-pellucid mucous membrane, with a polished surface, which invests the eyelids and anterior surface of the ball of the eye. This membrane consists of all that surface of the eye which is exposed in *Fig.* 1 of Plate X. of Part IX.; the eye-lids being everted. It commences at the margins of the eye-lids T, t, being a continuation of the skin; invests both eye-lids, running over the ciliary glands; and is reflected over the anterior aspect of the eye-ball, the caruncula lachrymalis, and plica semilunaris, so as to form a continuous or uninterrupted surface. Its adhesion to these objects is cellular. Where it begins to be reflected from the eye-lids, over the eye-ball, or vicê versâ, there is a doubling or loose fold or angle, which can be unfolded, so as to exhibit one extended smooth surface, by everting the ball of the eye out from the eye-lids. That portion of this membrane which invests the eye-lids is named tunica conjunctiva palpebrarum vel palpebralis, while that which covers the anterior aspect of the eye is termed tunica conjunctiva oculi, this latter being divided into conjunctiva corneæ and conjunctiva scleroticæ. Where the conjunctiva begins, it is pierced by the ciliary ducts; and where it passes over

* Where the lachrymal duct terminates in the nostril, stricture is said to occur most frequently.

† Syn. Tunica albuginea: Tunica adnata.

the caruncula lachrymalis, it is pierced by its ducts and hairs. By the majority of writers, the conjunctiva is considered as terminating around the outer margin of the cornea or transparent membrane of the eye; but its extension over the cornea is established by its being capable of being separated when the eye is a little putrescent,—by its acute sensibility, in which it differs from the cornea,—by the blood-vessels of the conjunctiva sclerotica extending over the cornea,*—and by analogy with the lower animals, the serpent tribe for example, shedding the conjunctiva corneæ at the same time with the epidermis. The conjunctiva which covers the cornea is perfectly transparent; no vessels can be seen on it; it is thinner than the sclerotica, and adheres most intimately to the external surface of the cornea. The conjunctiva sclerotica is thick and pulpy, of a white colour, has few or no red vessels on its surface, and adheres by loose cellular substance to the sclerotic coat, so as to enable the ball of the eye to move in all directions.†

The conjunctiva palpebrarum‡ is semi-transparent, extremely vascular,§ and of a reddish colour; it is thinner than the sclerotic portion, but thicker than the corneal; and it adheres loosely to the tarsus, where it leaves the sclerotica, but more and more firmly onwards to the ciliary margin, where they become consolidated.

The cornea‖ is the anterior transparent tunic of the eye, marked *f* in *Figs.* 1, 3, 5, 6, 8, and 10, *Figs.* 3 and

* This should be considered with reference to inflammation of the conjunctiva palpebralis and sclerotica, and also with respect to pterygia.

† The folds of the conjunctiva are sometimes the seat of serous effusion in inflammation of this membrane of the eye.

‡ Conjunctiva palpebralis.

§ The high vascularity should be kept in view in inflammation of this membrane.

‖ Syn. Cornea lucida: Cornea pellucida.

5 being magnified views of *Figs.* 2 and 4; it is a thick convex tunic, resembling the convex glass of a very small watch, and, with the sclerotic *s*, it forms the exterior case or stratum of the eye-ball. The eye-ball is not perfectly spherical, the line forming the visual axis exceeding its transverse diameter. It consists of several laminæ, loosely connected together, which can be developed by squeezing the cornea between the finger and thumb, or by incising the cornea, and separating the laminæ with the forceps, each lamina being found to consist of a fibro-cartilaginous structure.* The cornea is covered with the tunica conjunctiva, and is considered invested on its internal concave surface with the membrane of the aqueous humour. The cornea forms a pretty regular portion of a sphere, and is of equal thickness throughout, its refractive power being found to be greater than that of water.

The iris, marked *i* in *Figs.* 3, 5, 6, and 7 of Plate XII. of Part X., extending from the letters *f* onwards to the black circle in the centre, is that beautiful circular membrane stretched across the eye, which produces such diversity of expression in each countenance, according to the difference of its colour. It extends from the ciliary circle or ligament,† which is the circle of union of the cornea *f*, sclerotic coat *s*, and ciliary folds, across or centrad in the

* The thickness of the cornea, and its consisting of layers thus adhering and sliding on each other, should be kept in view by the operator, otherwise he will have no conception of its structure when he comes to perform either anterior reclination of the lens, keratonyxis, or extraction of the lens. We cannot lacerate the cornea either with the fingers or the forceps.

† Syn. Annulus gangliformis tunicæ choroidæ: Annulus ligamentosus: Orbiculus ciliaris: Plexus ciliaris: Commissure de la choroïde. It is of considerable importance in operative surgery to be aware, that at this point, where the cornea and sclerotic coat are united, the ciliary processes and iris also are connected, and likewise that the ciliary processes adhere to the vitreous humour, and capsule of the crystalline lens. This connexion is clearly displayed in *Figs.* 4 and 5, the latter being an enlarged view of the former.

aqueous humour, in which it floats, having an aperture nearly in its centre, named the pupil, marked *p* in *Figs.* 3, 5, and 7, which varies in magnitude in the living state, according to the comparative intensity of the light. The iris appears a congeries of blood-vessels, and is supposed to be muscular; its anterior surface presents a beautiful stellated appearance, or representation of some wicker-work, and varies in colour in different individuals; while its posterior or central surface is said to consist of a circular arrangement of fibres; but this appears incorrect. In *Fig.* 7 of Plate XII., which is a posterior view of the iris, its arrangement is also radiated. The colour of this surface is always a uniform dark brown; it is a thick stratum of the pigmentum nigrum, and is named uvea. The outer circular margin, which adheres to the ciliary circle, is named its ciliary; and the border of its central aperture is termed its pupillary margin, which is thin and sharply defined, and always of a dark colour, being covered with pigmentum nigrum, or by the uvea. The pupil is not precisely in the centre of the iris, the nasal being narrower than the temporal side. In the fetus, it is filled up with a delicate vascular opaque membrane, termed the membrana pupillaris, which begins to disappear about the seventh month.

The tunica sclerotica,* marked *s* in *Figs.* 1, 3, 5, 6, 8, and 10, is the hard thick and bluish-white coat which forms the greater portion of the external stratum of the eye-ball, extending from the cornea to the optic nerve 2, the latter of which pierces it in minute filaments, so as to form small foramina. This tunic is also pierced by the ciliary nerves *c*, arteria centralis retinæ *k*, with its concomitant vein *z*, the ciliary arteries *d*, and the ciliary veins *h*, as represented in *Figs.* 1, 5, 8, and 10. The sclero-

* Syn. Cornea opaca, seu tunica albuginea.

tic can only be separated from the cornea by long maceration. It is so firm in its texture, which is fibrous, that it retains its figure when the humours are evacuated or removed, and we cannot lacerate it with the fingers or forceps. It is somewhat thinner anteriorly than posteriorly, and its external surface is rough and cellular, affording insertion to the muscles of the eye-ball, while its internal surface is smooth and glistening, being lined by the choroid coat.

The choroid coat,* marked *b* in *Figs.* 5, 8, 7, 9, 10, and 11, is the soft thin delicate vascular membrane immediately interior or centrad to the sclerotic coat, which it invests, extending from the optic nerve 2 onwards to the crystalline lens *l*, in *Figs.* 4, 5, and 9. Its surface, which adheres to the sclerotic coat, as displayed in *Fig.* 8, is named pigmentum nigrum;† but this colouring matter pervades its whole structure, and is evidently an adventitious substance. The surface looking centrad or adhering to the retina *r* in *Fig.* 10, is termed, after Ruysch, tunica Ruyschiana; but in the human eye we cannot separate the choroid coat into two layers, as in the ox and many other animals. The whole texture of the choroid coat is a congeries of blood-vessels, as clearly exemplified in *Fig.* 8, with this brown adventitious pigment, for it is brown in man. Posteriorly, the choroid coat is pierced by the filaments of the optic nerve, the arteria centralis retinæ, with its accompanying vein, and some of the ciliary arteries. On tracing the inner or central surface of the choroid coat from the optic nerve onwards to the crystalline lens, as displayed in *Figs.* 4, 5, 7, and 9, we observe, that at some distance before arriving at the lens, it forms a number of parallel loose folds, radiating around

* Syn. Tunica vasculosa oculi.

† Syn. Pigmentum fuscum.

the lens, which are marked *m*, and which constitute what is named the ciliary zone;* the small apices or points of which that adhere to the capsule of the lens, and project into the posterior chamber of the aqueous humour, as represented in *Fig.* 6, and marked *n*, are termed the ciliary processes.† In *Figs.* 4 and 5 the choroid coat is invested with the retina.

These ciliary folds or plicæ *m*, as seen in these figures, are observed to constitute nearly one-fourth of the choroid coat; and in *Fig.* 4 a peculiar dark ring or areola is perceived immediately before these plicæ begin to be formed. The processes, where they project into the anterior chamber, are also darker. The print or impression of these plicæ on the vitreous humour is delineated in *Fig.* 12, the humour being marked *o*, and the impression with which always some of the plicæ remain, is marked *m*. These folds consist of the same structure as the rest of the choroid coat, being fully more vascular and more plentifully supplied with nerves.

The retina *r*, *Figs.* 10, 11, 4, and 5, is the delicate medullary expanse of the optic nerve, which lines the choroid coat, being situated between it and the vitreous humour. In *Figs.* 4 and 5, which are vertical sections of the eye, *Fig.* 5 being a magnified view of *Fig.* 4, we observe the optic nerve 2 becoming singularly constricted, reduced nearly to one-third, piercing the cribriform spot of the sclerotic *s* and choroid *b* coats, and expanding in a delicate pulp-like mucilage over the choroid coat and ciliary zone *m*, dipping between the plicæ so as to invest the whole, onwards to the capsule of the

* Syn. Corpus ciliare: Tunica ciliaris.

† Syn. Corona ciliaris: Ciliary ligament: Rayons sous-iriens. "In regard to the names appropriated to this part of the eye," says Mr. C. Bell, "there is more confusion than it is possible to believe."

lens l, where it terminates. By most authors it is allowed to consist of two substances or two layers, a medullary expansion of the nerve, and a vascular membrane supporting it; but some consider this vascular layer to be internal or central to the medullary, while others hold the reverse. Dr. Jacob, of Dublin, has lately attempted to demonstrate a third layer, which he considers a distinct membrane of the eye, alleging, "that the retina is covered on its external surface by a delicate transparent membrane, united to it by cellular substance and vessels." But this appears to be nothing more or less than the membrane described by Monro secundus, who in his description of the retina observes, "The whole or retina appears to be composed of a uniform pulpy matter, on the outer side of which chiefly vessels are dispersed, supported, I suppose, by a *membrane* the same or analogous to the pia mater." The retina adheres by extremely delicate cellular substance both to the choroid coat and to the vitreous humour. In *Fig.* 10 delicate blood-vessels are seen ramified on the exterior or choroid surface of the retina; and in *Figs.* 4 and 5 the arteria centralis retinæ k, with its vein z, is observed running in the centre of the section of the optic nerve 2, and entering at what is termed the porus opticus. In *Fig.* 11 the artery is seen radiating over the internal surface of the retina, or that which adheres to the vitreous humour. In this last figure also a delicate conical papilla, or process, or fold, is observable, marked S, with the foramen* and delicate zone of Soemmering, of a pinkish colour around. By Soemmering the latter is said to be yellow. This process or fold is supposed by Sir E. Home to be the production of art, which appears correct; for when we cautiously make a horizontal section

* Syn. Foramen centrale.

of the eye, leaving as much as possible of the vitreous humour, we do not see this process. Meckel contends, that it is more palpable in the fetus than in the adult; but remarks, however, that he has observed no foramen here, but only a spot almost entirely deprived of medullary substance, of an oval figure, and which is surrounded with a free border neatly cut; and that this spot is not very apparent unless we compress the vitreous humour, so as to repress the process around or without, and to efface it. The retina is transparent in the living, but opaque in the dead state.

The optic nerve does not enter in the centre of the sphere, but a little towards the inner or mesial or nasal aspect, as is best illustrated in *Fig.* 1 of Plate XI. of Part X. This nerve is invested with a production of the dura and pia mater. The former terminates at the sclerotic, to which it intimately adheres, but does not form the sclerotic, as described according to some authors; the latter or sclerotic being formed as early as the dura mater in the fetus, is remarkably thick and strong, while the envelope of the nerve is exceedingly delicate. The pia mater envelopes the nerve also to the eye-ball, where it likewise ceases, and does not form the choroid, or any other membrane. Monro describes it as entering with the nerve, and forming the membranous expanse between the choroid and retina. But this mania of making one part form another appears truly absurd, when we consider, that in the early fetus, vessels are distributed to every organ and to every texture of the body, in order to secrete them; so that the heart and arteries, modified by the nerves, are the only sources of formation.

I shall now proceed to describe the humours of the eye, which are three in number; the aqueous, the crystalline, and the vitreous.

The aqueous humour is situated between the cornea *f* and the crystalline lens *l*, as will be easily understood by examining the enlarged view of the eye, *Fig.* 5, Plate XII., which is a vertical section, wherein the lens has been left entire. It is divided into two chambers; that marked B, which is situated between the concavity of the cornea *f* and the anterior surface of the iris *i*, is named the anterior chamber, and is the larger of the two; while that marked P, which is contained between the posterior surface of the iris *i*, and the anterior surface of the capsule of the lens *l*, together with the ciliary processes *n*, is termed the posterior chamber of the aqueous humour, and is so small that the iris appears to be in contact with the lens.* The fluid undulates freely from the one chamber to the other through the medium of the pupil. This humour consists of only four or five drops of a watery fluid, possessing powerful solvent qualities, supposed to be secreted by a membrane which invests the cornea, the iris, the ciliary processes, and the capsule of the crystalline lens, constituting a serous pouch. This membrane, I have already stated, can be seen on the cornea, but not on the other surfaces.

The crystalline humour or lens, marked *l* in *Figs.* 4, 5, 6, 9, 12, 13, and 14, is situated immediately behind the posterior chamber P of the aqueous humour, and anterior to the vitreous *o*, in a recess of the latter of which it is imbedded, and surrounded by the ciliary processes *n*, and its own peculiar capsule. In *Fig.* 12, the lens *l*, together with the vitreous humour *o*, having the impres-

* This part should be kept in view in inflammation of the eye, so as to account for the adhesion which so frequently occurs between these parts; and also with regard to some of the operations, as depression and reclination of the lens.

sion of the ciliary folds *m*, is removed from the case formed by the tunics of the eye, which figure compared with *Figs.* 4 and 5, vertical sections of the eye, in which the lens has been left entire, enables us to have a clear conception of the lens. In *Figs.* 4 and 5 it is also seen to be immediately behind the iris *i* and its pupil *p*, there being little or no interval of space between these.* The lens is an oblate spheroid—seen by examining *Figs.* 13 and 14, figure 13 being an anterior, and figure 14 a posterior view, the latter of which is much more convex than the former, and is entirely imbedded in the vitreous humour. This difference is better exemplified in *Figs.* 4 and 5. The lens is remarkably transparent in the healthy eye; the exterior portion is soft like jelly, and may be removed by gently squeezing the lens between the fingers, leaving a central nucleus, of the consistence of slightly softened wax. In its transparent condition no fibres are observed; but when opaque, it exhibits a fibrous structure, having a radiated appearance, which is supposed to be muscular.

* The precise situation and relation of the lens to the contiguous objects, should be thoroughly understood by the operator. These are most faithfully delineated in *Fig.* 4, having compared this representation more than once with nature, in order to be certain of its accuracy. The iris does not extend so as to form a plain or flat surface across the aqueous humour, but is slightly convex anteriorly or dermad where it looks to the cornea, and concave posteriorly or centrad when it looks to the lens. In consequence of the anterior convex surface of the lens projecting beyond the level of the vitreous humour and ciliary processes, this is of necessity the case, otherwise the uveal or posterior surface of the iris with its pupillary margin would touch the lens in all its multifarious movements. It may be naturally asked, why I have not described the iris having a convex and concave surface; my answer is, that I had not an opportunity of again comparing *Fig.* 4 with nature, in so recent a state as to decide so important a fact, until after the description of the iris had gone to press, and I was naturally anxious to be perfectly confirmed in my ideas of so important a relative point, before delivering them to the profession.

The radiations on each side of the lens are, according to Dr. Young, ten in number.

The crystalline lens *l* is surrounded with a transparent film, named tunica crystalloidea, or capsule of the lens, which is very tough, firm, compact and elastic, its anterior portion being more so than its posterior, and requiring some force to lacerate it.* The posterior portion adheres so intimately to the membrane surrounding the vitreous humour, that they are inseparable, thus rendering it even doubtful if both exist, and giving rise to the opinion, that the whole capsule of the lens is a production or continuation of the membrana vitrea or hyaloidea; but these membranes are so dissimilar in their structures, that they seem quite different. In the fetus two membranes are observable behind the lens. The lens adheres to its capsule in two or three points, either by delicate nerves, blood-vessels, or cellular web.

A small quantity of watery fluid, named, after Morgagni, aqua, or aquula Morgagni, is situated between the capsule and the lens; and exterior to the capsule of the lens, at its marginal circumference, a small canal is perceptible, formed between this tunic and the membrana vitrea, which is named after Petit. Dr. Young, in the Bakerian lecture published in the Phil. Trans. for 1801, describes a thin glandular zone, filling up the marginal part of the capsule of the crystalline lens, which, he says, "may possibly secrete the liquid of the crystalline." He observed this glandular zone in the lower animals, particularly the partridge, but not in the human eye; from analogy, however, and from the spotted appearance of the image of a lucid point observable in one of his

* The toughness and firmness of the capsule of the lens should be kept in view by the operator.

experiments, he infers the existence of something similar in the eye of man.

The vitreous humour *o*, in *Figs.* 12, 4, and 5, is a tremulous transparent jelly, situated posterior to the crystalline lens, and surrounded by the retina, occupying therefore the greater portion of the sphere or case of the eye formed by the sclerotic coat, and forming four-fifths of the whole globe of the eye. It consists of a clear watery fluid, contained in transparent cellular cysts, and enveloped in an equally pellucid membrane, named vitrea or hyaloidea; so that by removing the cornea, iris, and lens, we can press out this humour entire from the retina, choroid, and sclerotica, like a mass of clear glass, as exemplified in *Fig.* 12; for it is not until we prick or cut this gelatinous mass, that the watery fluid, somewhat like the albumen of an egg, escapes or exudes. On the anterior or peripheral aspect of the vitreous humour, there is a concavity which receives the posterior convex surface of the crystalline lens, (which can be easily comprehended by examining *Figs.* 12, 4, and 5); and to this concave surface and its brim, the tunica crystalloidea is attached. In *Fig.* 12, the radiated zone *m* is the print of the ciliary plicæ, a few of which remain, in consequence of their adhesion to the retina, and the adhesion of this latter to the vitreous humour. Some of the blood-vessels of the retina are also observable on this vitreous humour *o*.

I shall now proceed to the description of the muscles which move the eye and its appendages; and of these, the orbicularis palpebrarum and the corrugator supercilii have been already described. The superior eye-lid has one peculiar to itself, named levator palpebræ superioris; and the eye-ball has four straight, and two oblique muscles. All these muscles, with the exception of the inferior ob-

lique, derive their origin from the margin of the optic foramen of the sphenoid bone, *i, s,* the levator palpebræ superioris, the superior oblique, and the four straight muscles.

The levator palpebræ superioris muscle,* marked L in *Figs.* 2, 3, and 4 of Plate X. of Part IX., and in *Figs.* 15 and 16 of Plate XII. of Part X., is situated immediately beneath the roof of the orbit and periorbita; in order, therefore, to display this and the other muscles and objects under description, it is necessary to break up the roof of the orbit, by removing, partly with a saw, but chiefly with a cartilage knife, or chisel and hammer, the orbitary plate of the frontal bone, and the transverse spinous process of the sphenoid bone, which enters into the formation of the foramen opticum, and foramen lacerum anterius, preserving carefully the foramina orbitaria interna, and the depression which gives attachment to the cartilaginous pulley of the superior oblique muscle. This will be readily understood on examining *Fig.* 3 of Plate X. of Part IX. When the bone has been thus broken up, if the object be to display both the nerves and the muscles, the dissector must proceed in removing the periorbita with great care, as many of the nerves adhere intimately to this membrane. He must be also prepared to encounter a considerable quantity of delicate soft adipose substance, interspersed between the muscles, nerves, and blood-vessels, that surround and supply the eye-ball, and which render the display of these objects difficult and tedious. The dissector should

* Syn. Palpebrarum secundus, oculum aperiens: Musculus parvus et tenuis palpebram attollens: Rectus: Palpebræ superioris primus: Superiorem palpebram attollens: Apertor oculi, attollens palpebram superiorem: Pyramidalis: Aperiens palpebram rectus: Le releveur propre: Orbito-palpebral: Orbito-sus-palpebral.

display on the one eye, the muscles, arteries, and veins, and on the other, the nerves; or he may examine in the first eye, the muscles, blood-vessels, and nerves generally, and in the second eye, these organs minutely.

The levator palpebræ superioris derives its origin, partly fleshy and partly tendinous, from the superior or coronal margin of the optic foramen of the sphenoid bone, becomes soon entirely fleshy, and advances immediately beneath the roof of the orbit to its margin, where it spreads on the upper surface of the tarsus, running onwards to its outer edge, and is lost in a delicate tendinous expanse or insertion. Mr. Crampton, in his Essay on Entropeon, says, that this muscle "is not inserted into the tarsus, but merely connected with it by means of the attachment of this last to the conjunctiva and to the integuments." Mr. Guthrie, in his able work on the Operative Surgery of the Eye, says, that "it would have been more correct to have said that the muscle is inserted into the conjunctiva, and into the process of the epicranium or broad ligament suspending the tarsal cartilage, to the upper edge of which the ligament is affixed." The function of this muscle is indicated by its name.

The rectus superior, or attollens oculi muscle,* marked A in *Fig.* 4 of Plate X. of Part IX., in *Fig.* 1 of Plate XI., and in *Figs.* 15 and 16 of Plate XII., is situated on the upper or coronal aspect of the eye-ball, immediately beneath or basilad to the levator palpebræ superioris L, to which it adheres; derives a tendinous origin from the

* Syn. Tertius oculum movens: Unus ex quatuor oblongis musculis: Unus ex quatuor qui rectis motibus præfecti; Ex iis qui rectis famulantur motibus: Rectus superior: Qui a physiognomicis superbus dicatur: Attollens sive superbus: Primus attollens; Superbus: Rectus attollens oculi: Elevator oculi: Elevator: Le releveur: Levator oculi: Sus-optico-spheni-scleroticien: Elevateur de l'œil.

upper or coronal aspect of the optic foramen of the sphenoid bone, soon becomes fleshy, and advances with longitudinal fibres to the eye-ball, on which it extends, running superficially or coronad to the tendon o* of the obliquus superior, to be inserted by a tendinous expanse in the sclerotic coat near its middle, or near the circumference of the eye, the tendinous striæ advancing onwards to the margin of the cornea, and being intimately connected with the sclerotic. This tendinous expanse, together with that of the other three straight muscles, is remarkably white, and appears to contribute to the formation of what is named in popular language the white of the eye. The function of this muscle is to elevate or roll the ball of the eye upwards, as its name indicates.

The obliquus superior oculi muscle,* marked O in *Figs*. 3, 4, and 2 of Plate X. of Part IX., in *Fig*. 1 of Plate XI., and in *Figs*. 15 and 16 of Plate XII. of Part X., is situated on the inner and upper aspect of the orbit, close to the periorbita; derives a tendinous origin from the same aspect of the foramen opticum of the sphenoid bone, on the inner aspect of the origin of the levator palpebræ superioris, and advances on the inner and upper aspect of the orbit, becoming fleshy in its course onwards towards its cartilaginous pulley *c*, where it again becomes tendinous; runs in a membranous sheath, marked *o* in *Fig*. 2 of Plate X., and through the pulley *c*; and afterwards extends outwards and down-

* Syn. Tertius palpebrarum: Duorum in gyrum flectentium prior: Obliquus ille qui per trochleam ducitur: Trochleæ musculus: Trochlearis: Alter ex obliquis superior, seu major: Sextus, obliquorum secundus, circumageus interior, aut superior, vel etiam major: Obliquorum, qui major est: Obliquus superior, vel trochlearis: Obliquus superior: L'oblique superieur: An gracillimus est rectus quintus, vel musculus trochlearis: Obliquus superior oculi, seu trochlearis: Optico-trochlei-scleroticien: Grand rotateur de l'œil.

to roll or revolve the eye-ball downwards being the antagonist of the attollens.

These four recti muscles send their tendinous expansions over the anterior aspect of the sclerotic coat, from about the middle onwards to the cornea, meeting with each other so as to form an even layer, which, as already mentioned, contributes chiefly to form what is named in popular language the white of the eye.

The musculus lachrymalis, lately discovered by Dr. Horner* of Philadelphia, marked l in *Fig.* 3 of Plate XI., where the eye-lids U, *u*, are turned outwards and forwards, is situated at the inner angle of the orbit, behind or centrad to the lachrymal sac and canals, to which it adheres. It is of an oblong shape, derives its origin from the posterior surface of the os lachrymale, near the plane surface of the ethmoid bone (see Part I. Plate IV. *Fig.* 1, dig. 17), by a vertical arrangement of fibres, which adhering to the lachrymal sac, advance in a parallel order outwards or temporad, dividing into two fasciculi at the angle of junction of the eye-lids, each bundle of fibres proceeding along one of the canaliculi lachrymales outwards to its punctum, where it terminates or is inserted. The superior fasciculus of fibres is blended with the orbicularis palpebrarum. The function of this muscle, according to Horner, is "to draw in the puncta and to keep the edges of the eye-lids properly adjusted to the ball of the eye," &c.; while, according to Trasmondi,† who has discovered the nerves which influence this muscle, its function is to act upon the lachrymal sac and canals, to compress the caruncula lachrymalis, so as to favour the excretion of the matter secreted by its glandular

* London Medical Repository, vol. xviii. p. 32.

† Melanges de Chirurgie étrangere. Genève, 1821, p. 415.

cryptæ, and also to render tense or relax the membrane of the lachrymal sac, so as to augment or diminish the bottom of the sac, and hence to press the tears down into the nasal duct. My own opinion is, that it performs all these actions, and also directs the tears into the puncta, and presses the lachrymal canals, so as to conduct and direct the tears into the sac.

The eye, with its appendages, is almost exclusively supplied with blood by the ophthalmic artery, which is a branch of the internal carotid, as described in Part VIII., p. 36, and seen in Plate XI. of the same Part, marked *o*. This artery, seen also in Plate XII. of Part X., *Figs.* 15 and 16, marked *o*, is observed to derive its origin from the internal carotid 19, and to enter the orbit with the optic nerve 2,* at the optic foramen, enveloped in a sheath of the dura mater; it then runs tortuously around the optic nerve from beneath upwards, and over it to the mesial or inner wall of the orbit onwards to the nose, emerging between the cartilaginous pulley *c* of the superior oblique muscle, and the ligament common to the tarsi, where it inosculates with the facial artery *c*, as delineated in Plate X. of Part II., and with the infra-orbitary artery. In this course the ophthalmic artery gives origin to a number of branches, as the lachrymal, the central artery of the retina, the supra-orbital, the ciliary, the muscular, the ethmoidal, the palpebral, the frontal, and the nasal. This artery does not always run in the first instance beneath the optic nerve, for it proceeds at once above or coronad to it.

The lachrymal branch 7 is one of the first and largest given off, and proceeds along the abductor muscle *a* to

* The close proximity of the optic nerve to the internal carotid and ophthalmic arteries, should be kept in view in diseases of the eye, as amaurosis, &c.

These anterior arteries send also branches to the ciliary folds. These long branches, which run between the sclerotic and choroid coats, are termed the long ciliary arteries;* and those which pierce the sclerotic near the cornea, are styled the anterior ciliary arteries. The long ciliary arteries are more regular in their origin from the trunk of the ophthalmic, and pierce the sclerotic coat further from the optic nerve, than the short ciliary arteries.

The muscular branches are very irregular both in their origin and number; I have already mentioned, that the supra-orbital artery supplies the attollens oculi and levator palpebræ muscles, and the lachrymal artery the abductor oculi muscle. A small branch in general accompanies one of the divisions of the third pair of nerves to the muscles, and there is usually a long inferior branch which supplies the depressor and inferior oblique muscles. These muscular branches supply the adipose substance.

The ethmoidal branch, marked 9 in *Figs.* 15 and 16 of Plate XII. of Part X., derives its origin from the mesial or inner aspect of the ophthalmic artery; enters the nares at the foramen orbitarium internum posterius, to be distributed on the mucous membrane of the ethmoidal cells, and that of the nares, inosculating with the nasal branches of the internal maxillary artery, as described in Part II., pages 46 and 47, also in Part IX., page 54. Another ethmoidal branch, marked 10 in *Figs.* 15 and 16 of Plate XI. of Part X., is given off by the ophthalmic artery, which enters the nares at the foramen orbitarium internum anterius, and also supplies the mucous membrane of the ethmoidal cells, and that of the nares, (see page 54 of Part IX.)

* Syn. Les artères ciliaires longues, iriennes.

The palpebral branches are small arteries, deriving their origin where the ophthalmic emerges between the pulley of the superior oblique, and the ligament common to the tarsi, and proceed to supply the palpebræ and tarsi, forming arches near the margins of the eye-lids, and sending branches to the ciliary glands, the conjunctiva, the caruncula lachrymalis, saccus lachrymalis, musculus lachrymalis, and orbicularis palpebrarum; inosculating with the supra-orbital, infra-orbitary, facial, and temporal arteries.

The frontal branch emerges from the orbit between the pulley of the superior oblique, and ligament common to the tarsi, and ascends on the forehead, dividing into small twigs that supply the corrugator supercilii, and occipito-frontalis muscles, inosculating with the supra-orbital artery.

The nasal branch is the continuation of the ophthalmic, and has therefore been already described onwards to the nose, along the side of which it descends to inosculate with the facial artery, as delineated in Plate X. of Part II.; and in this course supplies the lachrymal sac, the musculus lachrymalis, and the lower eye-lid.

Although I have described these minute branches of the ophthalmic artery in this manner, the student must not expect regularity of origin, or even of distribution; it appears sufficient to find the course of the trunk, and branches supplying the parts in its progress. Dr. Barclay describes only the course of the trunk, mentioning the parts which its branches supply.

The blood which is circulated by the ophthalmic artery and its branches, is returned to the cranium by the ophthalmic vein, the branches of which are nearly the same as those of the artery, and have almost a similar distribution.

The frontal vein, which returns the blood of the frontal, nasal, and supra-orbital arteries, and part of that circulated by the palpebral branches, has been already described in p. 49 of Part II. and is marked *z*, in Plate X. of the same Part. A free communication is established between this vein, and the beginning of the ophthalmic vein, marked V in *Figs*. 15 and 16 of Plate XII. of Part X., which commences at the inner angle of the eye, between the pulley of the superior oblique, and the ligament common to the tarsi, and accompanies the ophthalmic artery *o*, running backwards or centrad along the inner or mesial wall of the orbit across the optic nerve, between it and the attollens oculi muscle to the outer or temporal aspect of the latter, and between it and the abductor oculi, to enter the cranium at the foramen lacerum anterius, there joining the cavernous sinus; the coats of the ophthalmic vein, or sinus, as it is frequently named, forming the anterior commencement of the cavernous sinus. In this course the ophthalmic vein V receives the ethmoidal veins *w*, several muscular veins *x*, the lachrymal vein *y*, the ciliary veins *h*, and the vena centralis retinæ *z*.

The ethmoidal, the muscular, and the lachrymal are the simple venæ comites of their respective arteries, but the ciliary veins have a peculiar course. These begin on the uveal aspect of the iris, near the pupillary margin, running in a radiating manner backwards to the ciliary ligament, which they pierce, so as to arrive on the sclerotic aspect of the choroid coat, where they terminate in that beautiful arrangement of small veins named the venulæ, or vasa vorticosa, marked *h* in *Fig*. 8 of Plate XII. These venulæ vorticosæ collect the blood from the iris, the ciliary plicæ, and the whole of the choroid coat, and emerge piercing the sclerotic coat in two or more trunks, which proceed backwards, or centrad, to terminate in the ophthalmic vein.

Other veins are described accompanying the ciliary arteries, and named the long ciliary veins, while others again are described accompanying the anterior ciliary arteries, and termed the anterior ciliary veins; neither of these last, however, were injected in the eyes from which these diagrams were taken, and consequently are not delineated.

The venula centralis retinæ, marked *z* in *Figs.* 4 and 5, begins near the termination of the retina, collecting the blood circulated by its artery, inosculating with the ciliary veins, and its own branches, and congregating its branches, returns to the porus opticus, to enter the nerve in company with its artery, along which it runs for some length, and then emerges and joins either the ophthalmic vein, or runs backwards between the abductor and depressor muscles, entering the cranium at the foramen lacerum anterius, to terminate in the cavernous sinus.

The nerves which proceed to the eye and its appendages, are the optic, the motor oculi, the pathetic, the ophthalmic branch of the trigeminus, and the abducens.

I shall describe these nerves in the order in which they present themselves in dissection. When the roof of the orbit is broken up, as in *Fig.* 3 of Plate X. of Part IX., the nerves which appear nearly on a level, are the pathetic 4, the twigs *n*, *f*, *l*, of the ophthalmic branch 1, of the trigeminus 5, with the motor oculi 3. These, with the exception of the motor 3, adhere so intimately with the dura mater D within the cranium, and with the periorbita in the orbit without the cranium, that it requires great care and much patience to preserve them. A great quantity of delicate soft adipose substance is also found giving support to these nerves, which likewise renders their dissection difficult and tedious.

The first nerve to be investigated is the fourth, or pathetic 4,* the origin of which has been already described in page 30 of Part VIII., and represented in *Fig.* 7 of Plate VII., in Plates X. and XI., and in *Fig.* 2 of Plate XII. of the same Part; it enters the fold of the tentorium, passes through the cavernous sinus, adhering closely to the dura mater; emerges at the foramen lacerum anterius, (see Part I., Plate V., *Figs.* 9 and 10), forming a junction with the ophthalmic branch 1, of the trigeminus 5, as seen in *Fig.* 3 of Plate X. of Part IX., and almost immediately separates and runs towards the inner or mesial wall of the orbit, to be distributed on the superior oblique muscle O.

The first or ophthalmic branch 1, of the trigeminus 5, ought to be next investigated. The origin and course of the trigeminal nerve 5 to the cavernous sinus has been already described in page 31 of Part VIII., and delineated in *Fig.* 7 of Plate VII., and in Plates X. and XI. of the same Part, marked 5. In the cavernous sinus, the fifth or trigeminal nerve 5, sends small threads to unite with the great intercostal nerve, and forms a peculiar plexus or ganglion, named Casserian,† marked G in *Fig.* 3 of Plate X. of Part IX., and then divides into its three branches, marked with the digits 1, 2*, 3*. These nerves adhere intimately to the dura mater. The first or ophthalmic branch 1, the smallest of the three, originates from the upper or coronal aspect of the ganglion, and proceeds to the foramen lacerum anterius of the sphenoid bone, (mark-

* Syn. Nervus oculo-muscularis superior, seu minimus, seu musculi oculi superioris, seu par cerebrale quartum: Le nerve moteur supérieur ou interne: Nerf moteur interne, nerf oculo-musculaire interne.

† Syn. Ganglion semilunare: Plexus gangliformis: Intumescentia ganglio affinis: Plexus retiformis: Tænia nervosa; Intumescentia semilunaris: Aggerlunatus: Armilla.

ed 2 in *Fig.* 10 of Plate V. of Part I.); forms a junction with the fourth, or pathetic nerve 4, on the outer or temporal aspect of which it runs, and also on the outer and upper, or temporal and coronal aspect, with regard to the third pair, marked 3; and then entering the orbit, it divides into three conspicuous twigs, marked *n*, *f*, *l*, the nasal, frontal, and lachrymal. Sometimes it divides only into two twigs, in which case the frontal gives origin to the lachrymal.

The frontal nerve,* marked *f*, is the largest of the three, proceeds, united at first with the pathetic 4, and adhering to the periorbita, superficially to the levator palpebræ superioris muscle L, onwards to the superciliary foramen, dividing in this course into the supra-trochlear twig *p*, and the proper frontal twig *f*. Before this division of the frontal nerve, it not unfrequently gives origin to a small filament, which unites with the infra-trochlear twig of the nasal branch, and enters the frontal sinus. The supra-trochlear twig *p* proceeds along the inner or mesial wall of the orbit, to the cartilaginous pulley *c*, in *Fig*. 4, superior or coronad to which it advances out of the orbit, and is then named internal frontal twig, and is distributed on the corrugator supercilii, the orbicularis palpebrarum, the occipito-frontalis, and the skin, and also unites with the threads of the infra-trochlearis and the proper frontal nerve. The proper frontal branch *f*† proceeds out of the orbit at the superciliary foramen, sometimes single, but more commonly in two or more filaments, which ascend over the superciliary ridge on the forehead, to supply the skin of the eye-brow and the occipito-frontalis muscle, as delineated in Plate X. of Part II., seen accompanying the frontal artery, marked 91, where it ascends

* Syn. Le nerve palpebro-frontal.

† Syn. External frontal nerve.

to the vertex, forming in its course junctions with the facial nerve. As this nerve emerges from the orbit, it sends twigs to the orbicularis palpebrarum muscle, and some of its threads do not pass through the foramen.

The lachrymal nerve, marked *l* in *Figs.* 3 and 4 of Plate X. of Part IX., and in *Fig.* 1 of Plate XI. of Part X., the smallest of the three branches, proceeds outwards or temporad, adhering to the periorbita, and running on the abductor oculi muscle *a*, and delicate adipose substance, onwards to the lachrymal gland *q*, dividing in its course into two or three twigs. The interior or mesial twig enters the gland, subdividing into many filaments to supply its substance; but others emerge from the gland, and are distributed on the integuments of the upper eye-lid and forehead, forming junctions with the facial and frontal nerves. The exterior or temporal twig proceeds through the gland, and unites with a subcutaneous twig of the superior maxillary nerve, which enters the orbit at the spheno-maxillary fissure, and unites with a twig of the deep temporal branch of the inferior maxillary nerve. This nerve supplies the internal aspect of the superior tarsus.

The nasal nerve,* marked *n* in *Figs.* 3 and 4 of Plate X. of Part IX., and in *Fig.* 1 of Plate XI. of Part X., intermediate in size to the other two branches, is situated internal or mesial to these, running across the orbit to its mesial or inner wall. It begins, as seen in *Fig.* 1 of Plate XI., immediately where the ophthalmic nerve 1 enters the orbit, proceeds beneath the levator palpebræ superioris L, and attollens oculi A muscles, and superior or coronal to the optic nerve 2; then ascends between the attollens A and adductor a muscles, as delineated in *Fig.* 4 of Plate

* Syn. Naso-ocularis: Nasalis internus: Ophthalmicus: Ethmoidalis: Naso-lobaire.

X., running across the latter, and beneath the superior oblique muscle O, as in *Fig.* 3 of Plate X., to the foramen orbitarium internum anterius (see Part I. Plate IV. *Fig.* 1). At this aperture the nerve enters the cranial cavity, runs along the cribriform lamella *a* of the ethmoid bone, emerging out of one of its anterior foramina, and descending into the nares along the cartilaginous septum onwards to the apex of the nose, where it anastomoses with twigs of the superior maxillary and facial nerves.

In this course the nasal nerve gives origin to several twigs. Almost at its very commencement, it sends off a twig, named by some ramus ciliaris, which contributes to form the lenticular ganglion, marked *g* in *Fig.* 1 of Plate XI. This twig is occasionally double. In its progress onwards, it not unfrequently gives origin to one or more distinct ciliary nerves, and even before sending off the twig to form the lenticular ganglion, it gives origin to one or two threads which unite with the third pair 3. As the nerve proceeds towards the internal anterior orbitary foramen, it gives origin to a twig which advances along the inner wall of the orbit, beneath the obliquus superior and adductor muscles, to the pulley *c*, in *Fig.* 4 of Plate X., and in *Fig.* 1 of Plate XI., which is named the nervus infra-trochlearis. This nerve, after sending twigs to the pulley and to the musculus lachrymalis, emerges out of the orbit, supplying the conjunctiva, the caruncula lachrymalis, saccus lachrymalis, orbicularis palpebrarum, occipito-frontalis, and the skin of the nose; anastomosing with the supra-orbital, the facial, and the infra-orbitary nerves. In the nares, the nasal nerve supplies the frontal sinus, and the Schneiderian membrane investing the ethmoid bone; and on the exterior of the nares, it sends twigs to the ala nasi. This nasal nerve, in very rare instances, receives its origin from the sixth pair

of nerves; and in nearly equally rare instances, it has not contributed to the formation of the lenticular ganglion.

The third pair of nerves, or motores oculorum,* marked 3 in *Fig.* 7 of Plate VII., in Plates X. and XI. of Part VIII., in *Figs.* 3 and 4 of Plate X. of Part IX., and in *Figs.* 1 and 2 of Plate XI. of Part X., have been already described in page 30 of Part VIII., from their origin to their entrance in the cavernous sinus. In this sinus or vein, the motor oculi nerve proceeds exterior or lateral to the internal carotid artery 19, emerges at the foramen lacerum anterius, lying beneath and internal, or mesial and basilar to the pathetic 4, and the ophthalmic branch 1 of the trigeminal nerve 5, and enters the orbit between the attollens A and abductor oculi *a* muscles, on the outer or temporal aspect of the optic nerve 2, and almost immediately divides into two conspicuous branches, a superior and an inferior. The superior, which is the smaller of the two, as represented in *Fig.* 1 of Plate XI., runs superficially or coronad of the nasal branch *n* of the ophthalmic division of the fifth pair, and soon divides into two twigs, marked I and *z*; the former I, proceeding to be distributed on the levator palpebræ superioris muscle L, and the latter *z*, to be ramified on the attollens oculi muscle A. From an inadvertency, the twig I is marked with the digits 20 in *Fig.* 4 of Plate X. of Part IX. This superior branch generally forms a junction with the nasal nerve *n*, and not unfrequently pierces the attollens oculi to arrive at the levator palpebræ.

The inferior branch, the larger of the two, runs first on the outer or temporal aspect of the optic nerve 2, and

* Syn. Nervus oculo-muscularis inferior, seu medius, seu oculo-motorius, seu par tertium: Le nerf moteur commun: Moteur oculaire commun: Le nerf moteur commun: Le nerf oculo-musculaire commun.

then beneath or basilad to it, and divides into three twigs marked, a, b, and o, in *Fig.* 2 of Plate XI. In this figure, the optic nerve is turned forwards and outwards together with the eye-ball, in order to bring these nerves into view. In *Fig.* 1 of the same plate these objects are in their natural position and relation to each other. The twig marked a proceeds basilad or beneath the optic nerve 2, to the inner aspect of the orbit, and is distributed on the adductor oculi muscle a. The middle twig b, b, consisting of two filaments, proceeds straight forwards to be ramified on the depressor oculi muscle *d*. The external twig o runs along the outer or temporal aspect of the optic nerve 2, and a little beneath or basilad, onwards to the obliquus inferior oculi muscle *o*, on which it is distributed. In its course, this last twig o gives origin to a very short filament, which contributes to form the lenticular ganglion *g*, as represented in *Fig.* 1 of Plate XI.

This lenticular ganglion then is generally formed by this long slender branch o of the third pair, and the nasal branch *n* of the ophthalmic nerve of the fifth pair; the former of which is observed to send a very short nerve, which frequently consists of several filaments; while the latter sends a long slender twig, as represented in *Fig.* 1 of Plate XI. It rests on the outer or temporal aspect of the optic nerve 2, between the attollens A, and the abductor oculi *a* muscles, as represented in *Fig.* 4 of Plate X.; is of a reddish tinge, and is so encompassed with delicate soft adipose substance, that it is very liable to be removed in dissection. The ciliary nerves, varying in number and in arrangement, proceed from this ganglion; sometimes they run individually, as in *Fig.* 4 of Plate X., and in *Figs.* 1 and 2 of Plate XI.; at other times they form two or three fasciculi: when two, the superior fasciculus adhering to the optic nerve consists sometimes

of three and sometimes of six twigs; the inferior fasciculus, which is generally the larger, consists sometimes of six, and sometimes of from eight to ten twigs, and does not adhere to the optic nerve, but descends downwards and outwards. These twelve or sixteen, and occasionally twenty ciliary nerves, marked *c* in *Fig.* 8 of Plate XII., proceed individually along the optic nerve to the sclerotic coat, which they pierce near the optic nerve 2, or between this and the middle of the eye-ball, and run between this tunic and the choroid coat onwards to the iris. These nervous filaments seldom or ever unite in their course to the iris, and on their arrival at the ciliary ligament they generally divide into two threads, which describe an acute angle, and advance to the anterior surface of the iris, where they run in a radiated manner onwards to the pupil, having trifling enlargements in their course, which are supposed to be ganglia.

Some authors describe these ciliary nerves as not affording any threads to the choroid coat in their progress; but this appears fallacious, for when we lift gently up any of these ciliary nerves, we find delicate threads adhering and piercing the choroid coat; besides, it is contrary to the nature of nerves to run along any organ or membrane without affording to it branches. The lenticular ganglion is said to receive nervous threads from the great sympathetic nerve. The ciliary nerve which proceeds direct from the nasal nerve, enters the eye-ball about the middle of the sclerotic coat, and unites with these ciliary nerves just described, and advances together with them onwards to the iris.

The abducens or sixth nerve,* marked with the digit 6, in *Fig.* 7 of Plate VII., Plates X. and XI., and *Fig.* 2 of

* Syn. Nervus oculo-muscularis externus, seu posterior: Le nerf moteur externe: Le nerf moteur oculaire externe.

VIII., is described in page 31 of the its origin to its entrance in the cavernous nerve is also represented in *Figs.* 3 and 4 of Part IX., and in *Figs.* 1 and 2 of Plate XI. of ikewise marked 6. In *Fig.* 1 of Plate XI. of it is observed to run beneath or basilad to the um *d*, and to pierce the dura mater, where it invests uneiform process of the occipital bone, from thence to cend and enter the cavernous sinus, running between he motor oculi 3, and the ophthalmic branch 1 of the trigeminal nerve, and adhering to the outer or lateral aspect of the internal carotid artery 19, onwards to the foramen lacerum anterius. At this fissure it emerges from the cranium, and enters the orbit between the attollens A, and the abductor oculi *a* muscles, to be ultimately ramified on the latter of these two. In its course through the cavernous sinus, where it first touches the internal carotid artery 19, two or more soft filaments are given off, which descend along the artery to unite with the twig of the vidian nerve, marked I in *Fig.* 3 of Plate IX. of Part IX., to form the great sympathetic nerve. In this last figure, the manner of union of these nerves is distinctly delineated. In some rare instances, the abducens nerve gives origin to the nasal nerve, and not unfrequently sends a filament to the lenticular ganglion.

The second or optic nerve, represented in *Fig.* 7 of Plate VII., in Plates X. and XI., in *Fig.* 5 of Plate XII., and in Plate XIII. of Part VIII., marked 2, has been already described in page 29 of the same Part onwards to its emergence at the optic foramen of the sphenoid bone, and is observed in Plate X. of Part VIII. to emerge with the ophthalmic artery *o*. In *Figs.* 3 and 4 of Plate X. of Part IX., and in *Fig.* 1 of Plate XI. of Part X., it is seen after its entrance in the orbit, to run beneath or basilad to the

pathetic 4, the twigs *n*, *f*, *l*, of the ophthalmic branch 1, of the trigeminus 5, the motor oculi 3, and the abducens 6, and surrounded by the recti muscles A, a, *a*, *d*, together with the levator palpebræ superioris L, and obliquus superior O, muscles, and also by the ciliary nerves *c*, sent off from the lenticular ganglion *g*. The nerve advances enveloped in a strong sheath formed by the dura and pia mater, to enter the eye-ball a little towards the mesial or nasal or inner aspect, as minutely described in pages 16 and 14, in order to form the retina.

The superior maxillary nerve,* the second branch of the fifth pair, should have been described in Part IX., as therein expressed at page 55. In *Figs*. 3 and 4 of Plate X. of Part IX., and in *Fig*. 1 of Plate X. of Part X., the trigeminal nerve is observed dividing into its three branches, the ophthalmic 1, the superior maxillary 2*, and the inferior maxillary 3*, as already described in page 34. The superior maxillary nerve 2*, intermediate in size to the other two branches, descends forwards beneath the dura mater, to which it adheres, onwards to the foramen rotundum, at which it emerges from the cranium, when it immediately divides into two or more branches. The first is a small nerve named the malar, or subcutaneous of the cheek, marked *c* in *Fig*. 4 of Plate VI. of Part IX., which enters the orbit at the spheno-maxillary fissure, runs exterior or temporal to the abductor oculi muscle, uniting with the temporal twig of the lachrymal nerve, described in page 36, and advances adhering to the periorbita, onwards to the middle of the os malæ, through a foramen of which it emerges on the cheek, to supply the orbicularis palpebrarum muscle, and integuments of the cheek, anastomosing with the facial and the

* Syn. Nervus medius quinti paris.

infra-orbitary nerves, as delineated in *Fig.* 4 of Plate VI. of Part IX. This malar nerve frequently divides in its course, as seen in this figure; and occasionally sends filaments direct to the lachrymal gland. The superior maxillary nerve then divides into two large branches, the infra-orbitary 2, and the pterygo-palatine, the latter of which afterwards subdivides into the palatine P, and the vidian V, as delineated in *Figs.* 4 and 5 of Plate VI. of Part XI.

The infra-orbitary nerve, marked 2 in *Figs.* 4 and 5 of Plate VI. of Part IX., and Plate IX. of Part II., and partially described in page 65 of the latter Part, ascends in the spheno-maxillary fissure, in order to enter the infra-orbitary canal in the floor of the orbit, in which it runs, and emerges at the infra-orbitary foramen to be distributed on the face. Before entering the infra-orbitary canal, this nerve gives origin to one or two branches, named dental,* and marked *d* in *Fig.* 4 of Plate VI. of Part IX. This dental nerve *d* is observed to send off almost immediately from its anterior aspect a long slender filament, named its anterior branch, which proceeds to be distributed on the buccinator muscle; the trunk of the nerve *d*, named the posterior branch, then continues to descend on the exterior wall of the antrum maxillare, or superior maxillary bone, giving origin to filaments that supply the mucous membrane which invests that cavity, to filaments which supply the bone, the three posterior molar teeth, the gums, and the pterygoid and buccinator muscles, some of these threads uniting with the nerve that supplies the anterior teeth.

In its course along the infra-orbitary canal, the infra-

* Syn. Nervus alveolaris posterior superior: Nervi alveolares sive dentales priores.

orbitary nerve 2 is observed in *Fig.* 5 of Plate VI. to send off a small filament, marked *a*, which is named the anterior dental nerve, to distinguish it from the preceding, named in this case the posterior dental nerve. In many instances there are more than one anterior dental nerve. This nerve *a* pierces the superior maxillary bone, and sends filaments to the mucous membrane of the nose, the mucous membrane of the antrum maxillare, and descends to supply the gums, the incisive, the canine, and anterior molar teeth, forming a junction with the preceding or posterior dental nerve *d*.

The infra-orbitary nerve 2 then emerges at the infra-orbitary foramen, as described in page 65 of Part II.

The pterygo-palatine nerve,* or the trunk common to the pterygoid *v* and palatine P nerves, is described by Meckel to form before its division a round triangular or cordiform ganglion, termed ganglion Meckelii,† or ganglion spheno-palatinum, which, however, is allowed not to be always present, and I confess that I have never observed it. This pterygo-palatine nerve almost immediately divides into the two nerves, the pterygoid *v*, and the palatine P.

The palatine nerve P‡ descends in the palato-maxillary canal to the palate, and emerges at the posterior palatine foramen, running horizontally by the side of the teeth onwards to the anterior palatine foramen, as delineated in *Fig.* 1 of Plate VII. of Part IX., and anastomosing with the nasal twig of the same nerve, which descends to the palate by the incisive or anterior palatine foramen. In this course the palatine nerve gives origin to several branches, an external palatine nerve, marked *p* in

* Syn. Spheno-palatine nerve. † Memoires de Berlin, 1749, p. 84.
‡ Syn. Nervus naso-palatinus.

Fig. 4 of Plate VI. of Part IX., which not unfrequently arises by more than one branch,* that descends behind the bulbous process of the superior maxillary bone to the velum palati, onwards to the uvula *f*, supplying in this progress the gums, the pterygoid muscles, the levator and tensor palati and azygos uvulæ muscles, and also the glandular and mucous structures of the velum and tonsils.

The palatine nerve is also observed in *Figs*. 4 and 5 to give origin to small filaments near the letter P, which enter the nares at the spheno-palatine aperture, (marked *o* in *Fig*. 4 of Plate IV. of Part I.) The greater number of these are distributed on the mucous membrane which invests the mouth of the Eustachian tube, the sphenoid and palatine cells, and the bones of the nares, and are termed the superior posterior nasal nerves. One of these nerves descends along the septum narium to the foramen incisivum, which it perforates, and meets with the nerve of the opposite side, and also the termination of the trunk of the palatine nerve, forming sometimes a small ganglion in the incisive canal, named ganglion naso-palatinum.

The palatine nerve P, in *Fig*. 5 of Plate VI., is observed to give origin to three other filaments immediately beneath the letter P, which pierce the nasal lamella of the palatine bone, to be distributed on the mucous membrane investing the inferior spongy bone and floor of the nares. These are named the inferior posterior nasal nerves.

These nasal nerves form junctions with the olfactory nerves.

* Syn. Nervi palatini minores: Nervus palati minor posterior et nervus palatinus minimus exterior.

The trunk of the palatine nerve P, in *Fig.* 4 of Plate VI., is also seen to give origin to one or two other nerves that are descending to supply the pterygoid muscles and velum palati.

In the palate, the palatine nerve P divides into a number of filaments, as represented in *Fig.* 1 of Plate VII., which supply the gums and the soft palate, and anastomose with the threads of the nerve of the opposite side.

The pterygoid or vidian nerve,* marked *v* in *Figs.* 4 and 5 of Plate VI., and in *Fig.* 3 of Plate IX. of Part IX., reflected from the trunk common to this and the palatine P, enters the vidian canal of the sphenoid bone, along which it runs, and re-enters the cranium, dividing into its petrosal twig p, described in page 86 of Part IX., and its intercostal twig I, the latter of which proceeds on the outer or lateral aspect of the internal carotid artery, marked 19 in *Fig.* 3 of Plate IX., dividing and uniting with the reflected twigs of the abducens nerve 6, in order to form the great intercostal nerve 7, described in Part II., page 53. In general, this branch unites also with the trigeminal nerve. Before the pterygoid or vidian nerve enters the vidian canal, it sends off small filaments, some of which enter the spheno-palatine aperture to be distributed on the mucous membrane of the nares, anastomosing with the olfactory nerve, and are named the posterior superior nasal nerves; others of which pierce the internal pterygoid plate of the sphenoid bone, and descend to be ramified on the velum palati.

* Syn. Nervus quinti recurrens, seu anastomoticus.

ORGAN OF TOUCH.

I SHALL now proceed to the organ of touch, although, in a physiological order, it should have preceded the other senses, all of them being ultimately dependent on touch in the performance of their functions.

The immediate organ of touch consists of the whole superficies of the body, which is formed of the epidermis, the corpus mucosum, the cutis vera, the corpus cellulosum, and the corpus adiposum; together with the delicate termination of the extremes of the nerves, blood-vessels, exhalants, and commencements of the lymphatics.

The first pellicle which presents itself is named the epidermis,* and is best exemplified on the hand or foot, being there thickest. In Plate XIII. of Part X. are four views of the hand, *Figs.* 1 and 2 illustrating the epidermis. The epidermis covers the whole surface of the body, and even enters the mucous passages, as the eye, the nose, the mouth, the ear, the urethra, the vagina, and the anus; but so modified in these, that it is not easily detected, except at their commencements. The skin is therefore said to form a sac reverted upon itself, which surrounds all the organs of the body. The epidermis is a white, semi-transparent, insensible, membranous expansion, arranged in laminæ or squamæ, according to its thickness. In the negro it is of a clear greyish or cineritious colour, rather thicker, and scarcely semi-transparent. In delicate parts of the body, as the face, or glans penis, it consists of one lamina, is exceedingly thin, and even transparent; while in the palms

* Syn. Cuticle: Skarf-skin.

of the hands and soles of the feet it consists of squamæ, is remarkably thick, hard, and opaque, even in the fetus. The outer or peripheral aspect of the epidermis is rougher than the inner or central, the latter being smooth and glistening, in consequence of the moisture of the corpus mucosum. On both aspects or surfaces there are a number of rugæ, lines or wrinkles, from its receiving the impression of the various irregularities of the cutis, to which it intimately adheres; and on the interior or central, there are a number of delicate processes, which are the sheaths formed by the epidermis for the hairs that are transmitted: there are other processes, but shorter and more delicate, which are merely the points of adhesion between the epidermis and cutis vera. These are represented in *Fig*. 1, where the epidermis resembles a glove. Bichat is of opinion that these latter are the extremities of the exhalants and absorbents. Besides the hairs being transmitted through this membrane, there are small apertures or pores for the exudation of the exhalants, the excretory ducts of the glands of the skin, and for the commencements of the lymphatics. Lewenhoeck and Bichat contend that such apertures or pores exist, while Meckel and Humboldt deny their existence. These processes and foramina are best seen in a hand or foot which has been macerated for the purpose, by cautiously removing the epidermis. In *Fig*. 2, which is a view of the back of the epidermis that covers the hand, a number of foramina are observable.

The nails are those elegant appendages of the epidermis situated at the tips of the fingers, as represented in *Figs*. 1 and 2 of Plate XIII. They are of oblong shape, consisting of a root, body, sides, and a free distal margin, and formed of plates or laminæ, their outer or peripheral aspect being smooth and convex, while their inner or

central is concave and grooved, as delineated in *Fig.* 1 of Plate XIII. Even on the outer aspect there is a linear appearance. Their root and sides are firmly imbedded, wedged, or indented in the cutis vera, as may be understood by examining *Fig.* 3; thus the epidermis is reflected so as to adhere to their outer surface, excepting at their anterior free margins, where it is attached to their inner aspect; and their inner surface adheres securely, through the medium of its grooved structure, also to the cutis vera: The nails are thus perfectly secured in order to prevent all motion.

The straight margin of the root of a nail is thinner than the rest, and is slightly serrated, apparently the more effectually to prevent mobility; and as the root shoots beyond the epidermis to become the body, there is a white semilunar spot, which is termed the lunula; but this is not invariably lunated, being in some rare cases pyramidical, the apex pointing distad. This root diminishes in size from the thumb to the little finger, and varies in magnitude in different individuals. The body of the nail is situated beyond or distad to the lunula, and has a delicate pinkish tinge; and where it projects beyond the tip of the finger, it has a free distal margin, of a whitish colour, and thicker than elsewhere. When well formed, the margin is slightly arched; but from fashion or custom the nails are variously shaped, and of different lengths. If allowed to grow, they curve towards the palm of the hand.

The nails of the toes differ from those of the hand in being squarer, with the exception of that of the great toe, and in having generally no lunula. This last appearance or lunula depends on the cutis vera beneath, and so also does the delicate pink tinge distad to it.

The nails, like the epidermis, are totally destitute of sensation or vitality.

By maceration or putrefaction we are enabled to separate the epidermis, and then we arrive at a mucous stratum of fluid between it and the cutis vera, termed the corpus mucosum.* The corpus mucosum is a homogeneous mucous semi-fluid substance, lodged between the papillæ of the cutis vera, and is described by some to consist of three or more strata or beds. Gualtier describes an external and an internal white stratum or tunic, and an intermediate one, which he denominates the brown substance in the negro; and that the external stratum is the thinnest, while the internal is the thickest. Cruickshanks found four strata in a patient who died of small-pox. But from the fluid nature of the corpus mucosum, it is very difficult to distinguish any layers even in the negro.

The cutis vera is situated beneath or centrad to the epidermis and corpus mucosum, and is represented in *Figs.* 3 and 4 of Plate XIII. This is subdivided by some anatomists into a vascular web or membrane, a papillary tissue, and a derma or dermis, which subdivision, however, appears unnecessary.

The cutis vera, like the epidermis, extends all over the surface of the body, and into the mucous passages; it constitutes the chief portion of the skin, as represented in *Fig.* 3, where, at the place of section, the integuments above the wrist-joint are everted; it is of a white colour, and solid elastic consistence; is formed of laminæ of a somewhat fibrous structure, the fibres running obliquely from within outwards, and being more open in its texture within or centrad than without or peripherad, the latter

* Syn. Rete vel reticulum Malpighi; Rete mucosum: Le réseau muqueux ou vasculaire.

of which is very dense and firm. This openness of the central aspect of the texture of the cutis, enables the nerves and arteries to enter freely its structure. This fibrous structure is most apparent on the back and the soles of the feet, where it resembles very much the fibrous cellular tissue beneath, which it evidently becomes. The cutis is thickest in the soles of the feet, the palms of the hands, and the back; thinnest in the eye-lids, the scrotum, the penis, and the labia of the female; it is thinner in the upper than in the lower extremities; and much thinner in the face than in the scalp. The cutis beneath the nails is red and vascular; is very thick, soft, and having no layers, but an appearance of longitudinal fibres to correspond with the grooves on the central surface of the nails. There are small regular spiral ridges, with corresponding grooves, in the palms of the hands, as represented in *Fig.* 4, in the soles of the feet, and margins of the lips; and there are a number of small elevations, named textus papillaris, or papillary tissue,* which seem to be the termination of the nerves and arteries, and commencement of the veins and absorbents,† at the tips of the fingers and the back of the hand, as delineated in *Figs.* 3 and 4, and also in the face. Each papilla is found to consist of two smaller papillæ, which are most conspicuous on the lips, the mamma of the female, the palmar aspect of the fingers, the plantar aspect of the toes, and the glans penis: on the lips and glans penis these papillæ are named villi, and are extremely numerous. This papillary structure, together with the whole external or peripheral surface of the cutis, is described by Mr.

* Syn. Papillæ: Papillæ nervosæ: Papillæ pyramidales.

† Fodera has revived the ancient doctrine, that exhalation and absorption depend upon the capillary state of the tissues; and Jourdan and Breschet deny the existence of inhaling or exhaling vessels on the skin.

Baynham to be covered with a very delicate vascular web, composed of a multitude of central points united by a number of anastomosing vessels, disposed with great regularity. This, however, is unquestionably only the vascular papillæ.

In several parts of the body, as, for example, at the articulations, particularly the joints of the fingers, the cutis is thrown into loose folds; also on the forehead, the scrotum, and some other parts.

In various parts of the body, as the eye-lids, the extremity of the nose, the external cartilage and meatus of the ear, the nipple of the mamma, the vagina and the anus, there are a number of sebaceous glands * imbedded in the cutis. They are mucous follicles or cryptæ, which open external to the epidermis with open mouths, like small black dots, and terminate in the cutis with culs-de-sacs.

On investigating the integuments still deeper, we find, immediately under or centrad to the cutis vera, the cellular substance,† supporting in its cells the adipose substance ‡ and serous fluid, as delineated in *Fig.* 3 of Plate XIII., at the place of section above the wrist-joint, where the integuments are everted.

The cellular substance forms an envelope to the muscles, and pervades the whole body, forming the foundation or matrix of all the other organs. According to Bordeu, Meckel, Prochaska, and others, it is a coherent, homogeneous, viscous substance, scarcely solidified, and divested of form; it is the coagulable fluid in the state of coagulation, and technically named the mucous tissue. Several very interesting facts and ingenious arguments are

* Syn. Miliary glands: Mucous cryptæ.

† Syn. Tela seu textus cellulosus, cribrosus, mucosus: Membrana cellularis: Reticular substance: Tissu cellulaire: Le system muqueux.

‡ Syn. Corpus adiposum: Adeps: Pinguedo: Panniculus adiposus.

brought forward to support this theory; but what completely overturns it is, that when we take any quantity, however small, and immerse it in water hot enough to melt and remove the oleaginous matter, there remains a membranous film. On the other hand, according to Haller, Bichat, Beclard, and others, this cellular substance is correctly described to consist of an assemblage of lamellæ of soft white fibrils, the arrangement of which varies to infinity, and which form cells varying in figure and differing in magnitude, and communicating freely with each other, in such a manner that the whole cellular tissue forms only one cavity subdivided to infinity. The cellular substance is very elastic, but possesses little or no sensibility or mobility.

The cellular substance varies in quantity in various parts of the body; thus, for example, it is very abundant under the skin in some regions, as at the mamma, the nates, and mons veneris, in the female, also in the axillæ, the groins, and soles of the feet of both sexes; and is still more abundant in the pelvis. It abounds in the abdomen, as in the regions of the kidney and mesentery; in the thorax between the lamellæ of the mediastinum, and around the great vessels of the heart; and in the neck, about the carotids and lymphatic glands. In the superior extremities it is found in the course of the vessels, and between the muscles; and so also in the lower extremities, particularly around the popliteal vessels. There is very little cellular substance found about the eye-lids, penis, or scrotum; extremely little within the spinal canal; and little or none within the cranial cavity.

In the living body, the adipose matter is partly fluid and partly solid, and in some regions it is entirely the one or the other; it is of a yellowish colour, found in

masses of various forms contained in the cells of the cellular tissue; these masses being smallest immediately beneath the cutis vera, and becoming larger and larger centrad; nevertheless there are small ones mingled with the large.

The serous fluid, or serosity, is found throughout the cellular tissue, but occasionally exists without the adipose matter, as, for example, in the eye-lids and scrotum.

In the subcutaneous adipose substance a profusion of blood-vessels, chiefly veins, are seen, which are named vasa subcutanea.

The hairs are situated all over the skin or external surface of the body, with the exception of the palms of the hands and soles of the feet; but are more numerous in some places than in others, in general where the cutaneous joins the mucous structure, as at the eye-lids, the nostrils, the mouth, the external auditory tube, the anus, and the vagina. The hairs are also numerous on the scalp, the eye-brows, the axillæ, the groins, the pubes, and abdomen in both sexes, and on the breast and back of the male. The hairs in many of these places do not appear until puberty, as on the chin, the pubes, and the axillæ.

The hairs on the cheek and the forehead are the furthest separated from each other; 2dly, those in the nose, around the anus, and the extremities, are less so; 3dly, those on the pubes, axillæ, breast, abdomen, eye-brows, and eye-lashes; 4thly, those on the chin, or the beard; and lastly, those of the scalp, which are also the longest, and most numerous.

The hardest and stiffest hairs are at the external apertures of the nares, while the softest are those of the face, with the exception of the beard.

The hairs on the pubes are the thickest in diameter, next those of the axillæ, then those of the scalp, and lastly those of the eye-brows and eye-lashes.

The hairs consist of a root or bulb, a body, and a point or apex, and gradually taper from the bulb to the apex, and are slender according to their length. The bulb is soft and thick, consists of several filaments, apparently vascular, united by cellular tissue, and surrounded or enveloped by a cellular sheath, between and around which is an oleaginous fluid named the medulla of the hair. The bulb is imbedded in the cellular tissue beneath the cutis vera, with which it is connected through the medium of blood-vessels and nerves, at least this is the source of origin of the long hairs. The delicate short hairs may grow from the cutis. With respect to nerves being distributed on the roots of the hairs, Rudolphi has traced them into the bulbs of the mustaches of the seal. As the hair advances through the cutis, it acquires a sheath of epidermis, which is supposed by Albinus and others to extend to its apex; this sheath is of a whitish colour and transparent, and at the bulb consists of several laminæ.

INDEX

OF

THE LETTERS OF REFERENCE

TO

PART X.

THE EYE, AND THE VISCERA OF THE THORAX AND ABDOMEN.

PLATE XI. *Fig.* 1.

A, Levator oculi muscle
L, Levator palpebræ superioris muscle
O, Obliquus superior muscle
O*, Tendon of obliquus superior muscle
P, Pituitary gland
Y, Section of cranium

a, Adductor oculi muscle
f, Frontal twig of ophthalmic branch of fifth pair of nerves

a, Abductor oculi muscle
b, Crista galli
c, Cartilaginous pulley of superior oblique muscle
d, Tentorium
g, Lenticular ganglion

i, Infundibulum
l, Lachrymal twig of ophthalmic branch of fifth nerve
n, Nasal twig of ophthalmic branch of fifth pair of nerves
p, Supra-trochlear twig of ophthalmic branch of fifth pair of nerves
q, Lachrymal gland
z, Twig of third pair of nerves distributed on levator oculi muscle

a, Twig of third pair of nerves to adductor oculi muscle
I, Twig of third pair of nerves distributed on levator palpebræ muscle

PLATE XI. *Fig.* 1. *(Continued.)*

ɒ, Twig of third pair of nerves distributed on obliquus inferior muscle

1, Ophthalmic branch of fifth pair of nerves
2, Optic nerve
2*, Superior maxillary nerve
3, Motor oculi nerve
3*, Inferior maxillary nerve
5, Trigeminal nerve
6, Sixth or abducens nerve
19, Internal carotid artery

Fig. 2.

D, Dura mater
Y, Section of cranium

a, Adductor oculi muscle

a, Abductor oculi muscle
b, Crista galli
c, Ciliary nerves
d, Depressor oculi muscle
o, Obliquus inferior muscle
r, Reflected twig of sixth pair of nerves
z, Filament of third pair of nerves distributed on levator oculi muscle

a, Twig of third pair of nerves to adductor oculi muscle

ɒ, Threads of third pair of nerves to depressor oculi muscle
I, Twig of third pair of nerves distributed on levator palpebræ muscle
ɒ, Filament of third pair of nerves to inferior oblique muscle

1, Ophthalmic branch of fifth pair of nerves
2, Optic nerve
3, Motor oculi nerve
3*, Inferior maxillary nerve
5, Trigeminal nerve
6, Abducens nerve
19, Internal carotid artery

Fig. 3.

U, Upper eye-lid

l, Lachrymal muscle

u, Lower eye-lid

PLATE XII. *Fig.* 1.

c, Ciliary nerves
d, Posterior ciliary arteries
f, Cornea
h, Ciliary veins

s, Sclerotic coat

2, Optic nerve
8, Anterior ciliary arteries

Fig. 2.

Front view of the eye-ball.

Fig. 3.

Enlarged view of *Fig.* 2.

f, Cornea
i, Iris

p, Pupil
s, Sclerotic coat

Fig. 4.

Vertical section of the eye-ball, in which the crystalline lens is left entire.

Fig. 5.

Enlarged view of *Fig.* 4.

B, Anterior chamber of aqueous humour
P, Posterior chamber of aqueous humour

b, Choroid coat
f, Cornea
i, Iris
k, Arteria centralis retinæ
l, Crystalline lens

m, Ciliary folds
n, Ciliary processes
o, Vitreous humour
p, Pupil
r, Retina
s, Sclerotic coat
z, Vena centralis retinæ

2, Optic nerve

PLATE XII. *Fig.* 6.

f, Cornea
i, Iris
l, Crystalline lens
n, Ciliary processes
p, Pupil
s, Sclerotic coat

Fig. 7.

b, Choroid coat
i, Iris
m, Ciliary folds
n, Ciliary processes
p, Pupil
s, Sclerotic coat

Fig. 8.

b, Choroid coat
c, Ciliary nerves
d, Posterior ciliary arteries
f, Cornea
k, Ciliary veins
s, Sclerotic coat

2, Optic nerve

Fig. 9.

b, Choroid coat
l, Crystalline lens
m, Ciliary folds
n, Ciliary processes
r, Retina
s, Sclerotic coat

Fig. 10.

b, Choroid coat
c, Ciliary nerves
d, Posterior ciliary arteries
f, Cornea
r, Retina
s, Sclerotic coat

2, Optic nerve

Fig. 11.

S, Process of Sœmmering

b, Choroid coat
r, Retina
s, Sclerotic coat

PLATE XII. *Fig.* 12.

l, Crystalline lens
m, Impression of the ciliary folds
o, Vitreous humour

Fig. 13.

View of anterior surface of crystalline lens.

Fig. 14.

View of posterior surface of crystalline lens.

Fig. 15.

A, Levator oculi muscle
E, Eye-ball
L, Levator palpebræ superioris muscle
O, Obliquus superior oculi muscle
V, Ophthalmic vein

c, Cartilaginous pulley of superior oblique muscle
o, Ophthalmic artery
q, Lachrymal gland
w, Ethmoidal vein
y, Lachrymal vein

1, Ophthalmic branch of fifth pair of nerves
2, Optic nerve
2*, Superior maxillary nerve
3*, Inferior maxillary nerve
5, Fifth or trigeminal nerve
7, Lachrymal artery
9, Ethmoidal artery
10, Ethmoidal artery
19, Internal carotid artery
91, Supra-orbital, or frontal artery
99, Ethmoidal vein

Fig. 16.

A, Levator oculi muscle
E, Eye-ball
L, Levator palpebræ superioris muscle

PLATE XII. *Fig.* 16. *(Continued.)*

o, Obliquus superior oculi muscle
o*, Tendon of obliquus superior muscle
v, Ophthalmic vein

a, Adductor oculi muscle

a, Abductor oculi muscle
c, Cartilaginous pulley of superior oblique muscle
d, Posterior ciliary arteries
h, Ciliary veins
o, Ophthalmic artery
q, Lachrymal gland
w, Ethmoidal veins
x, Muscular veins
y, Lachrymal vein

1, Ophthalmic branch of fifth pair of nerves
2, Optic nerve
2*, Superior maxillary nerve
3*, Inferior maxillary nerve
5, Fifth or trigeminal nerve
7, Lachrymal artery
8, Anterior ciliary arteries
9, Ethmoidal artery
10, Ethmoidal artery
19, Internal carotid artery

PLATE XIII. *Fig.* 1.

Front view of the epidermis of the hand.

Fig. 2.

Back view of the epidermis of the hand.

Fig. 3.

Back view of the hand exhibiting the cutis vera.

Fig. 4.

Front view of the hand exhibiting the cutis vera.

PLATE XIV.

A, Ribs
A*, Symphysis pubis
B, Diaphragm
B*, Os sacrum
C, Os coccygis
D, Right ventricle of the heart
F, Spleen
G, Lungs
H, Left subclavian artery
I, Rectum
I*, Anus
K, Jejunum
L, Ileum
M, Triangular ligament of urethra
N, Cowper's gland
O, Bulb of urethra
P, Transverse portion of colon
T, Longitudinal muscular band of colon
X, Corpus cavernosum penis
Z, Scrotum

a, Peritoneum
b, Stomach
h, Omentum majus
i, Liver
m, Urinary bladder
r, Sphincter ani muscle
s, Arteria gastro-epiploica dextra
t, Prostate gland
u, Vesiculæ seminales
v, Vas deferens
w, contiguous to F, Arteria gastro-epiploica sinistra
w, contiguous to *f*, Ureter

c, Gluteal artery
f, Ischiadic artery
g, Left ventricle of the heart
*g**, Spermatic artery
*g***, Middle hemorrhoidal artery
k, Vesical artery
n, Catheter
z, Sigmoid flexure of colon

8, Phrenic nerve
14, Internal mammary artery

PLATE XV.

A, Ribs
A*, Pyriformis muscle
B, Diaphragm
B*, Sacrum
C, Renal artery
C*, Gluteus minimus muscle
E, Thoracic aorta
F, Spleen
F*, Gluteus maximus muscle
G, Lungs
H, Long sacro-ischiadic ligament
I, Œsophagus
I*, Rectum
I**, Anus
I***, Gluteus medius muscle
M, Caput cæcum coli
O, Ascending portion of colon
O*, Common iliac vein
P, Common iliac artery
S, Crista of the os ilium
T, Dorsal vertebræ
X, Obturator internus muscle, with gemelli muscles
Y, Kidney
Z, Tuberosity of os ischium

PLATE XV. *(Continued.)*

a, Peritoneum
b, Stomach
e, Abdominal aorta
e*, Trochanter major
f, Left branch of pulmonary artery
h, Short sacro-ischiadic ligament
i, Liver
k, Right bronchus
s, Levator ani muscle
w, Ureter
z, Diaphragmatic artery

a, Œsophageal plexus of nerves
b, Internal hemorrhoidal artery
c, Gluteal artery
f, Ischiadic artery
g, Spermatic artery
h, Internal pudic artery
i, Vena cava ascendens
p, Sacro-median artery
t, Lumbar artery
z, Sigmoid flexure of colon

1, Thoracic duct
2, Pulmonic plexus of nerves
2*, Left pulmonic veins
5*, Vena azygos
12, Intercostal arteries
15, Intercostal veins
20, Great sacro-ischiadic nerve

PLATE XVI. *Fig.* 1.

A, Cardiac orifice of stomach
B, Muscular tunic of stomach
D, Lesser arch of stomach
I, Œsophagus
T, Pyloric orifice of stomach
X, Greater extremity of stomach
c, Duodenum
p, Gastric artery
s, Arteria gastro-epiploica dextra
w, Arteria gastro-epiploica sinistra

a, Peritoneal tunic of stomach
b, Anterior or sternal aspect of stomach
b, Greater arch of stomach
x, Lesser extremity of stomach

Fig. 2.

A, Suspensory ligament of liver
B, Diaphragm
C, Round ligament of liver
D, Pancreas

PLATE XVI. *Fig.* 2. *(Continued.)*

E, Left lateral ligament of liver
F, Spleen
G, Lobulus quadratus vel anonymus
H, Pons hepatis
I, Right lobe of the liver
K, Jejunum
L, Ileum
M, Ductus communis choledochus
N, Vena portæ
P, Pancreatic duct
Q, Mesentery
R, Superior mesenteric artery
T, Pyloric orifice of the stomach
U, Superior mesenteric vein
V, Fossa umbilicalis

a Peritoneum
b, Stomach
c, Duodenum
e, Gall bladder
i, Left lobe of the liver
k, Lobulus Spigelii of liver
n, Right branch of vena portæ
q, Hepatic artery
r, Splenic artery
s, Arteria gastro-epiploica-dextra

e, Ductus cysticus
f, Ductus hepaticus
n, Left branch of vena portæ
s, Splenic vein

Fig. 3.

r, Splenic artery
s, Splenic vein

PLATE XVII. *Fig.* 1.

A, Cardiac orifice of stomach
B, Muscular tunic of stomach
D, Lesser arch of stomach
I, Œsophagus
T, Pyloric orifice of stomach

a, Peritoneal tunic of stomach
c, Duodenum

b, Greater arch of stomach
m, Mucous tunic of stomach

Fig. 2.

I, Right lobe of liver
M, Ductus communis choledochus
M*, Opening of ductus communis coledochus in duodenum
N, Vena portæ
T, Pyloric orifice of stomach
U, Superior mesenteric vein
V, Fossa umbilicalis
W, Fossa of gall bladder
Y, Lobulus caudatus

PLATE XVII. *Fig.* 2. (*Continued.*)

b, Stomach
c, Duodenum
e, Gall bladder
i, Left lobe of liver
k, Lobulus Spigelii
n, Right branch of vena portæ
p, Gastric artery
q, Hepatic artery

s, Arteria gastro-epiploica dextra

e, Ductus cysticus
f, Ductus hepaticus
i, Vena cava ascendens
n, Left branch of vena portæ
s, Splenic vein

PLATE XVIII. *Fig.* 1.

L, Ileum
Q, Mesentery

m, Mucous tunic of ileum

Fig. 2.

L, Ileum
M, Caput cœcum coli
O, Ascending portion of colon
T, Longitudinal muscular bands of colon

l, Ligament between ileum and colon

29, Appendix vermiformis

Fig. 3.

L, Ileum
T, Longitudinal muscular bands of colon

m, Mucous tunic of colon

v, Valve of colon

29, Appendix vermiformis

ERRATA AND OMISSIONS.

In page 10, last line of text, after *Figs.* 1, 3, 5, 6, 8, and 10, *read,* " of Plate XII."

In page 12, eighth line from the bottom, after *Figs.* 1, 3, 5, 6, 8, and 10, *read,* " of Plate XII."

In page 13, eleventh line from the top, after *Figs.* 5, 8, 7, 9, 10, and 11, *read,* " of Plate XII."

In page 14, eleventh line from the bottom of the text, after *Figs.* 10, 11, 4, and 5, *read,* " of Plate XII."

In page 17, sixth line from the bottom of the text, after *Figs.* 4, 5, 6, 9, 12, 13, and 14, *read,* " of Plate XII."

In page 20, third line from the top, after *Figs.* 12, 4, and 5, *read,* " of Plate XII."

In page 28, nineteenth line from the top, after " crystalline lens," *read,* " In birds and fishes, a blood-vessel is seen entering the vertex of the radiation of the lens."

In page 35, sixth line from the top, the letter italic "*f*" should be small roman " f."

In page 35, tenth line from the top, the letter italic " *f*" should be small roman " f."

In page 35, fifteenth line from the top, the letter italic "*f*" should be small roman " f."

In page 35, seventh line from the bottom, the letter italic "*f*" should be small roman " f."

In page 42, first line from the top, the letter italic "*f*" should be small roman " f."

PART XI.

ABDOMINAL VISCERA,

TOGETHER WITH

THE MALE AND FEMALE ORGANS OF GENERATION.

A

SYSTEM

OF

ANATOMICAL PLATES;

ACCOMPANIED WITH DESCRIPTIONS

AND

PHYSIOLOGICAL, PATHOLOGICAL, AND SURGICAL

OBSERVATIONS.

BY

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PART XI.

ABDOMINAL VISCERA, TOGETHER WITH THE MALE AND FEMALE ORGANS OF GENERATION.

EDINBURGH:

PRINTED FOR DANIEL LIZARS, 5 ST. DAVID STREET,

(LATE 61 PRINCES STREET);

S. HIGHLEY, 174 FLEET STREET, AND WEBB STREET, ST. THOMAS'S HOSPITAL, LONDON; AND W. CURRY, JUN. & CO. 9 UPPER SACKVILLE STREET, DUBLIN.

1826.

EDINBURGH:
Printed by John Brewster,
11, Society.

My Dear Sir,

In dedicating this Part to you, it affords me inexpressible satisfaction in having the present opportunity of publicly acknowledging my gratitude for the many acts of friendship which I have received from you, and particularly to express my thanks for the use of your valuable collection of preparations to make the drawings of the Gravid Uterus.

Believe me ever to be,

My Dear Sir,

Yours most faithfully,

John Lizars.

To Dr. William Campbell,
Lecturer on Midwifery, Edinburgh.

CONTENTS.

THE ORGANS

OF

MASTICATION AND DEGLUTITION.

THE organs in the thoracic cavity have been already described in Part II., from page 1 to 17; the reader, therefore, has only to apply the letters and digits therein marked, to Plates XIV. and XV. of Part X., to enable him to understand their application to these figures, and also to Plates I., II., III., and IV., of Part II.; but should he find any difficulty or obscurity, he must consult at the same time the index of the letters of reference to Plates XIV. and XV. of Part X.

Before proceeding to the examination of the abdominal viscera, it is requisite to advert to the organs of mastication and deglutition, the description of the greater number of which have been given in Part I. page 62, and Part IX. pages 15 and 58, as the mouth, the teeth, the gums, the mucous membrane of the mouth, the labial, the buccal, and the palatine glands, the fauces, and the pharynx, together with their various muscles; only the larger series of salivary glands,* therefore, remain to be described, as the parotid, the submaxillary, the sublingual, and the molar.

* Syn. Glandulæ salivares orales.

The parotid gland,* the largest of the salivary glands, is situated immediately anterior or glabellar to the external cartilage of the ear, extending from the zygoma downwards, a little beyond the angle of the inferior maxillary bone, and across the face, nearly one-third from the tragus to the angle of the mouth, or ala of the nose, resting on the masseter muscle, and converging to a point, from which its duct x proceeds imbedded in the adipose substance of the cheek, to pierce the buccinator muscle and mucous membrane of the mouth, in an oblique manner, opposite the second molar tooth of the upper jaw. The parotid gland is represented in Plate X. of Part II., marked s, its duct being indicated with the letter x. This gland, enveloped by a strong fascia, resembling that which invests the muscles and vessels of the neck, and appearing continuous with it, is partially covered by the platysma myoides muscle F; it is a conglomerate gland, or consists of a number of lesser glands, or lobules, of a pale reddish colour, agglutinated together by cellular membrane, from which proceed the smaller ducts that concentrate to form the larger duct x.† In the substance of this gland are imbedded the facial nerve, the temporal artery, and vein.‡ The parotid duct is a large excretory tube of a bluish white colour, remarkably thick in its substance, which is cellular, thus reducing the calibre of the canal, whose investment is serous. Where the duct pierces the mucous membrane of the mouth, it runs obliquely so as to act as a valve. In the living state,

* Syn. Superior maxillary gland. † Syn. Steno's duct: Ductus superior.

‡ The relations of this gland to these important blood-vessels and nerves should be considered by the general practitioner, and also the operator. The parotid, like other glands, is subject to inflammation, constituting cynanche parotidea, to scirrhus, cancer, and the various modifications of sarcoma, some of which require the knife to eradicate them.

a small elevation of a ruddy colour is observable where the duct enters the mouth. The parotid gland should be examined by the student when dissecting the blood-vessels, nerves, and muscles of the face.

Occasionally one or two smaller salivary glands are found, either at the commencement or in the course of the parotid duct, the ducts of which join the parotid. These glands are named socia parotidis, or glandulæ accessoriæ. Lymphatic glands are always found in the vicinity of the parotid gland.*

The submaxillary or inferior maxillary gland, one of the conglomerate class, delineated in Plate IX. of Part II., marked with the letters *n*, is situated under, or centrad and basilad of the angle of the inferior maxillary bone, having the facial artery *c* imbedded in or surrounded by its lobes, of which there are two or more. This gland is obscured completely by the platysma myoides muscle, and rests on the digastric and stylo-hyoideus muscles w. From its lobes small ducts proceed to form a larger one,† which runs between the mylo-hyoideus muscle *m*, and the lining mucous membrane of the mouth, apparently piercing the sublingual gland, marked 80 in Plate VII. of Part II., and entering the mouth by piercing its mucous membrane close to the side of the frænum linguæ, where a small papilla is observable, and where the entrance of the duct of the opposite side touches this papilla. The submaxillary duct does not pierce the sublingual gland, but runs between the gland and the side of the tongue, in a slightly waved manner, and is indicated by a bristle inserted in it, in Plate VII. of Part II. This duct is much more delicate and capacious than the paro-

* These lymphatic glands frequently involve the parotid in their diseased actions.

† Syn. Ductus inferior: Ductus Whartoni.

tid, being with difficulty distinguished from a vein which accompanies it; it is of a greyish colour, and consists externally of cellular fibres, and internally of a mucous membrane.*

One or more lymphatic glands are generally situated near the submaxillary gland.

The sublingual, another conglomerate gland, of an oblong figure, marked 80 in Plate VII. of Part II., is situated beneath the tongue, between the mylo-hyoideus muscle *m*, and the inferior surface or base of the tongue, with its extremities pointing to the apex and root of this organ, and having a considerable extent of its surface invested with the lining mucous membrane of the mouth. It is the smallest of the preceding salivary glands, and consists of more lobules, which are also softer. Several short ducts proceed from this gland, which pierce the mucous membrane of the mouth in the contiguity of the submaxillary duct, and are best exemplified in the living state, appearing then small papillæ. A distinct duct is described by some authors to proceed from this gland, and to join the submaxillary duct; but this I have never observed.

A molar gland, intermediate in size to these larger glands and the smaller described in Part IX. page 59, is described as being situated between the anterior margin of the masseter muscle and the outer aspect of the buccinator muscle, opposite the dentes molares of the

* The relation of the submaxillary gland and its duct to the contiguous objects should be well considered by the general practitioner and the operator, as this gland, like the parotid, is subject to the same diseases, and the lymphatic glands in its vicinity not unfrequently so involve the submaxillary, that the one cannot be removed by the knife without the other, a circumstance which has occurred to myself. The submaxillary duct is subject to obstruction and over-distension with its salivary fluid, constituting ramula; and calcareous concretions are not unfrequently deposited in this duct, requiring extirpation.

upper jaw, but I have never found any glandular body situated here; several small glandular bodies are found between the buccinator muscle and the mucous membrane of the mouth, opposite this region; but these are, strictly speaking, the buccal glands.

The labial, the buccal, the lingual, the palatine, and the pharyngeal glands, which have been described in Part IX., are conglobate glands, having single ducts or lacunæ piercing the mucous membrane of the mouth.

VISCERA OF THE ABDOMEN.

The abdominal viscera are represented in their natural situation in Plate I. of Part II., and Plates XIV. and XV. of Part X.; Plate I. of Part II. illustrating an anterior or sternal view, Plate XIV. a lateral one, and Plate XV. of Part X. a posterior or dorsal view.

The abdominal cavity is bounded superiorly or atlantad by the diaphragm, marked B in Plate I. of Part II., and Plates XIV. and XV. of Part X.; inferiorly or sacrad by the brim of the pelvis, delineated in Part I. Plate III. letter *y*, or by the *cul de sac* formed by the peritoneum a, extending between the bladder m and the rectum I, as represented in Plate XIV. of Part X. assisted by these viscera, together with the levator ani muscle, and the bones forming the outlet of the pelvis, according as the pelvic cavity is considered excluded or included in the abdominal; anteriorly or sternad by the integuments and abdominal muscles, as the recti and pyramidales, together with the tendinous expansions of the three lateral, as depicted in Part IV. Plates I. II. and III.; posteriorly or dorsad by the spinal column, together with the crura of the diaphragm, the psoæ and quadrati lum-

borum muscles, as represented in Plate IV. of Part IV.; and laterally by the false ribs, the ossa ilium, and lateral muscles of the abdomen and integuments, as delineated in Plates I. II. and III. of Part IV.*

The interior of this extensive surface is invested with a serous membrane, named the peritoneum, which is also reflected on all the abdominal viscera in a similar manner to the pleura, so that these organs are equivocally said to be without this membrane. It forms a perfect sac in the male, but is continuous with the mucous membrane of the Fallopian tubes in the female. The simplest method of investigating the peritoneum is to make first a transverse division of the abdominal parietes a little below the umbilicus, and then a perpendicular one in the linea alba from the centre of this transverse one to the symphysis pubis, and reflect these two flaps outwards. The small intestines must now be held upwards towards the diaphragm, and the peritoneum, a, may then be traced from the region of the umbilicus, sinistrad, laterad, and dorsad, to the sigmoid flexure z of the colon, over which intestine it next glides to the brim of the pelvis, extending around dorsad and dextrad to the caput cœcum coli M, over which portion of the same intestine it runs, to ascend on the abdominal parietes onwards to the region of the umbilicus, from whence we commenced. The peritoneum thus forms a continuous glazed serous surface, never passing behind any of the viscera; and will be easily comprehended, by supposing the simple experiment of making a small puncture in the abdominal parietes of a sound abdomen, and pouring or injecting into the cavity a mixture of Paris plaister and water, which is to be immediately removed.

* The physiologist should attend to these boundaries of the abdomen, to enable him to reason on respiration; and the surgeon, that he may comprehend the causes of hernia.

On opening this abdominal cavity, we should find every point of its surface, whether parietes or viscera, coated with the white pigment, which would precisely resemble the peritoneum.

Having investigated and understood this course of the peritoneum, we should next examine its structure, deferring the manipulation of its productions or processes until we come to investigate the viscera to which they belong. The flaps may be selected for the minute structure; and as the peritoneum in this region is concerned in hernia, and the securing of the external iliac artery, it ought to be carefully examined. The surface, which looks centrad or towards the cavity, is serous; while that which adheres to the abdominal muscles is cellular, the latter of which is best elucidated by tearing with the fingers the membrane from these muscles. In doing this we should attend to where it adheres firmly, which will be found to be particularly the case from the angle of the flap down to the line, immediately opposite Poupart's ligament. It adheres loosely at the linea alba, intimately to the tendon of the transversalis, and loosely again to the fleshy fibres of this muscle. In thus tearing the peritoneum from its connexions, it appears in some points much stronger than in others, in general where it admits of any extension, as near the urinary bladder; for according as this viscus is distended with urine, does it carry the peritoneum along with it: hence it is a very extensible membrane. The peritoneum is supplied with nerves from the various nerves in its contiguity, as the phrenic, the lumbar, and the great intercostal; but it does not appear to be peculiarly sensitive in the living state while in health, although it becomes exceedingly so in disease. This membrane is also supplied by numerous arteries, as the phrenic, the lumbar, the cœliac, the superior and

inferior mesenteric; it is not apparently very vascular in the living state during health, but becomes remarkably so in inflammation.

Properly speaking, before investigating the peritoneum even in the most superficial manner, we ought to examine the natural and relative situation of the abdominal viscera, in order to make ourselves acquainted with their situation when diseased. To facilitate this, the abdominal cavity is divided into the following regions, the epigastric, the umbilical, and the hypogastric or pubic, with their respective lateral ones; thus the epigastric has its hypochondriac regions, the umbilical its renal or lumbar regions, and the hypogastric its iliac or inguinal regions. To define the three chief regions, two parallel straight lines are drawn from the anterior superior spinous processes of the ossa ilium upwards on each side until they meet with one drawn at right angles, across from the upper or atlantal point of the ensiform cartilage, which space is divided by drawing other two straight lines at right angles to the preceding two, the one intermediate between the sacral apex of the ensiform cartilage and the umbilicus, which limits the epigastric region; the other extending across at equal distances between the umbilicus and the symphysis pubis, in order to indicate the umbilical and hypogastric regions; the former of which is, therefore, situated at equal distances between the ensiform cartilage and the symphysis pubis between the middle lines, and the latter between the lower or pubic of these two lines and the symphysis pubis. Those portions of the abdominal cavity which are on each side of the epigastric, are named the hypochondriac regions, and are bounded by carrying the straight line between the ensiform cartilage and the umbilicus completely around to the spinous processes of the spinal column, also the one from

the atlantal point of the ensiform cartilage across to the same processes of the spine. In a similar manner the two lateral regions of the umbilical are defined, and are named the renal or lumbar regions; and so also with the iliac or inguinal in regard to the hypogastric. Another method, which is probably the simpler, is to draw in the first instance the transverse lines from the ensiform cartilage,—from the intermediate point between this and the umbilicus,—from the intermediate point between the latter and the symphysis pubis,—and from the crista of the os pubis round to the spinal column, thus defining the three chief regions with their respective lateral ones at once; and then to subdivide each of these three into other three, by drawing the longitudinal straight lines from the spinous processes of the ossa ilium upwards. The space immediately centrad to the ensiform cartilage is termed the scrobiculus cordis. Monro primus, feeling the want of definite perspicuity in these regions, makes a tenth, which he names the lumbar, and defines,—" is the posterior part of the abdomen, and comprehends all that space which reaches from the lowest ribs on each side, and the last vertebra of the back, to the os sacrum and neighbouring parts of the ossa ilium. The lateral parts of this region are termed the loins." It must be confessed, that even with all these divisions, a great difficulty exists, particularly in morbid anatomy, to describe with accuracy the precise situation of any viscus. Thus, for example, the natural situation of the spleen is in the left hypochondriac region, and in morbid states it occasionally projects into the epigastric, the umbilical, the left renal, and left iliac regions; but these not having been hitherto so definitely marked, a difficulty existed of telling exactly what was epigastric, renal, or iliac region. I have been led to make these

remarks, and to point out with more perspicuity these regions than has been hitherto done, from a judicious suggestion of Dr. Duncan, Professor of Materia Medica in the University of Edinburgh.

When the anterior abdominal parietes are reflected aside, as in Plate I. of Part II., (in doing which, the student must attend to the preservation of the round ligament of the liver g, by making his incision on the left side of the linea alba from the umbilicus to the ensiform cartilage,) we observe the omentum majus h, obscuring nearly all the other viscera, which is the case when it is healthy; we however always perceive a portion of the stomach b situated atlantad to it, with part of the liver i still more atlantad and dextro-laterad, projecting from under the ribs; and inferiorly or sacro-pubic to the omentum h, the uterus k, and the urinary bladder m; the latter organs, however, are only seen in some female subjects, for in the majority of females they are covered by the omentum, and the same is the case in males with regard to the urinary bladder. On cautiously reflecting the omentum majus upwards on the stomach, liver, and ribs, we bring into view one of the large intestines, the colon marked M, O, P, in Plate IV. of Part II., and T in Plate XIV. of Part X., encircling the greater proportion of the small intestines marked K and L, the letter K indicating the jejunum and L the ileum.

On elevating the margin of the liver i, we see the omentum minus stretched between the stomach b, and the liver, with the gall bladder e on the concave aspect of the latter; on raising gently the stomach b, we perceive the spleen F, and the duodenum c; on feeling beneath or dorsad to the omentum minus, or rather on feeling through this delicate web, we touch the pancreas, marked D in Plate IV. of Part II.; on feeling beneath or

dorsad to the colon, immediately sacrad to the liver i, we find the kidneys, marked Y in Plate V. of Part II. and in Plate XV. of Part X. These are the different viscera found in the abdominal cavity, which are divided into the floating and fixed, or the chylopoietic and assistant chylopoietic viscera. In the abdominal cavity then are contained, the peritoneum, with its productions, the floating and fixed viscera, with their appendages, blood-vessels, nerves, and absorbents. The productions of the peritoneum are the omentum majus, the omentum minus, the mesentery, the mesocolon, the mesorectum, the ligaments of the liver and of the spleen. Under the floating viscera are comprehended the stomach, the small and large intestines; and under the fixed viscera, the liver, with the gall bladder, the pancreas, the spleen, and the kidneys. When we apply the term chylopoietic, we comprehend the stomach, the small and large intestines, together with the omentum majus and minus, the mesentery, mesocolon, and mesorectum. Under the assistant chylopoietic viscera, are comprehended the liver, the pancreas, and the spleen. The kidneys in this latter arrangement come under the organs of urine. I have intentionally left out the pelvic viscera, for the sake of simplicity. The nerves and blood-vessels have been already considered in Part II.

I shall now proceed to the description of the individual viscera, which I shall give in a connected order, and not in that which the student should adopt.*

* The student should proceed as follows: first, he ought to inflate the colon from the ileum, within six inches or so of the former; secondly, inflate the stomach and duodenum from the jejunum, within two or three inches of the duodenum, attending carefully to the course of the duodenum during his inflation; thirdly, inflate the jejunum and ileum either from where the aperture was made to inflate the stomach, or from that to distend the colon. Having made himself master of all

The omentum minus and majus are productions of the peritoneum. On tracing with the finger the glazed con-

the connexions of these viscera, and their natural and relative positions, together with the mesentery and mesocolon, he should examine the omentum majus and minus; next collapse the jejunum and ileum, and investigate the superior and inferior mesenteric arteries, with the nervous mesh on these vessels; thirdly, he ought to manipulate the colon, gradually and progressively removing it, by beginning at the caput cœcum, taking along with it the few inches of ileum, and cutting close to the intestine, so as to leave the mesocolon, and ending at the rectum. The structure of the colon, with its valve, &c. require to be deliberately investigated. Let him again return to the other viscera in the abdominal cavity, and proceed with the examination of the jejunum and ileum, the nerves, arteries, and veins of which having seen, and rudely traced, let him detach these intestines in the same way as he did the colon, cutting the mesentery close to the intestine, at which period he will comprehend the manner of the reflection of the peritoneal tunic over the intestine better than any other, also the course of the arteries, veins, and lymphatics, the last of which, however, are seldom discernible. When he has removed these intestines, he must examine most carefully their structure. He should now return to the abdominal cavity, and commence the minute examination of the liver and gall bladder, with their ducts, the duodenum, the stomach, the pancreas, and the spleen, together with the nervous mesh distributed on their blood-vessels, and these vessels themselves; also the formation of the vena portæ, by the gastric, the superior mesenteric, the inferior mesenteric, and splenic veins; and having satisfied himself of their situation, connexion, and relation to each other, let him remove, in a mass, the liver, the duodenum, the pancreas, the spleen, together with the veins forming the vena portæ, but leaving their respective arteries as long as possible. When insulating the liver, he must remove a portion of the vena cava ascendens, by dividing it immediately atlantad to the renal veins, and also atlantad to the liver itself, thus taking away that part of it which is connected with the liver. Having detached these viscera, which is rather a difficult task, he should investigate them most minutely. The stomach has been left, in order to witness the distribution of the nervi vagi, which will have been by this time traced by the gentleman occupied in dissecting the neck and thorax. If this has been done, the stomach should be also removed, and be likewise thoroughly investigated, having previously, however, examined the arteries proceeding to it, as also the veins returning from it; this mode of proceeding should invariably be attended to, for when once the viscera are removed, the blood-vessels are with difficulty understood. The student should now proceed to trace the distribution of the splanchnic nerves, and the trunks of the great intercostals, which, by this period, will have been dissected by the young gentleman engaged in investigating the neck and thorax. After the examination of the nervous system, he should proceed with that of the arterial, and having advanced to the renal artery, he should

cave surface of the liver i, in Plate I. of Part II., to the gastric p and hepatic q vessels, we find this glazing, which is the peritoneal tunic of the liver, become a loose web, apparently cribriform, and stretching to the duodenum and the concave lesser arch of the stomach b. This loose delicate web is joined by another lamina from the dorsal aspect of the liver, as will be readily comprehended by examining Plate XV. of Part X., which also advances to the concave lesser arch of the stomach, and this double cribriform web constitutes the omentum minus.* The omentum minus is thus bounded by the concave aspect of the liver, by the ducts and vessels extending between the latter and the duodenum, by that portion of the duodenum between these ducts and vessels and the stomach, and by the concave arch of the stomach and the œsophagus to the diaphragm.

The peritoneal tunic now embraces the stomach b, and contiguous portion of the duodenum, so as to invest both their surfaces, their sternal and dorsal, advancing to the greater convex arch of the stomach, and contiguous portion of the duodenum, where the two portions meet and become again a loose floating web, marked h, named the omentum majus,† which extends to the uterus k, where it is reflected inwards and backwards, or centrad and dor-

manipulate the kidney with its duct, the ureter, the latter of which he ought to inflate a few inches from the kidney, both upwards to see the relation of the pelvis to the blood-vessels, and downwards to witness its connexion with the urinary bladder. He may now remove the kidney, with its artery, vein, and ureter of some length, and investigate it minutely. The remaining arteries of the abdomen may now be examined, next the veins, and lastly, he should proceed to the pelvic viscera. I have been thus minute from having witnessed students much perplexed in what manner to proceed in their examination of the abdominal viscera.

* Syn. Omentum hepatico-gastricum : Membrana macilentior mesogastrium.

† Syn. Omentum colico-gastricum ; Epiploon.

sad, and upwards or atlantad to the transverse arch of the colon, marked P in Plate XIV. of Part X., where the two laminæ again separate to encircle this portion of the colon, and meet to constitute the mesocolon, the superior or atlantal layer of which advances upwards on the pancreas D, in Plate IV. of Part II., to the root of the liver i, and diaphragm B, thus forming a complete pouch,* the only aperture to which, termed the foramen of Winslow,† is dextrad and beneath or dorsad to the cystic and hepatic ducts and vessels. This aperture will be readily understood on comparing Plate I. of Part II. with Plate XVI. of Part X. The finger can be easily inserted dextrad and dorsad of the ducts *e*, *f*, M, of the vein N, and the artery q, in Plate XVI. of Part X., when it will be perceived that it raises the omentum minus, as delineated in Plate I. of Part II. The finger passes atlantad of the duodenum c, between the latter and the liver i. The inferior or sacral layer of the mesocolon descends to form the mesentery, and also the mesocolon of the ascending and descending portions of the colon. This peritoneal or omental pouch is also shut up on the left side by the peritoneum investing the spleen F, as will be comprehended by comparing Plates I. and IV. of Part II., with XIV. XV. and XVI. of Part X. From this description it will be at once understood, that that portion of the omentum majus, marked h in Plate I. of Part II., which floats on the small intestines, is quadruple, being formed of the two laminæ from the stomach, and the two layers from the transverse arch of the colon. No viscus in the abdomen is completely surrounded with peritoneum like an orange with its rind, but one and all are merely so enveloped as to be well supported, and in such a manner

* Syn. Marsupium omenti. † Syn. Porta omenti.

as to enable this membrane to glide onwards to the contiguous viscus. In Plate I. of Part II. the nerves and blood-vessels of this organ are represented, and their description given in the same Part.* If the omentum be very healthy and fat, in a young subject, we may succeed in inflating the omental pouch, by inserting a large blow-pipe, wrapped with cotton, in the foramen of Winslow; but in general it is either so thin and delicate, or so diseased, as to be incapable of this. When matted, there is a difficulty in separating the portion formed by the laminæ of the stomach, from that formed by those of the colon, the latter being closely connected to the greater convex arch of the stomach. If healthy, we can easily make an incision between the stomach and colon, and comprehend the general pouch. In some subjects the omentum majus extends to the ascending portion of the colon, near the caput cœcum, and is then named the omentum dextrum, or omentum cœci; some authors describe an omentum sinistrum; but we might with equal propriety make an omentum lienis, see Plate XIV. of Part X.

I shall now proceed to the description of the alimentary canal, which extends from the mouth to the anus. The mouth, fauces, and pharynx, have been already described in Part IX. In pages 14 and 16 of this latter Part, I have mentioned that the pharynx becomes the œsophagus immediately sacrad to the cricoid cartilage of the larynx, between the latter of which and its continuation the trachea, and the spinal column, the œsophagus descends, enters the thoracic cavity, running in the posterior cavity of the mediastinum, dextrad and sternad of the arch of

* The surgeon should make himself thoroughly master of the connexions of the omentum majus, and also of its nervous and vascular distributions, as this organ is the most frequently ruptured of all the abdominal viscera.

the aorta and its thoracic portion, downwards or sacrad to the diaphragm, at the central or right aperture of which it emerges from the thoracic and enters the abdominal cavity, when it almost immediately dilates to form the stomach. This course of the œsophagus is delineated in Plates I. IV. and VIII. of Part II., in Plate IV. of Part IV., in Plates I. II. III. IV. and V. of Part IX., and in Plates XV. XVI. and XVII. of Part X., marked with the letter I.

The stomach, marked b in Plate I. of Part II., and in Plates XIV. XV. XVI. and XVII. *Figs.* 1, of Part X., is situated partly in the left hypochondriac, but chiefly in the epigastric region, and contracts as it extends towards the right hypochondriac region to become the duodenum c, the first portion of the small intestines.* The duodenum, marked also c in Plate IV. of Part II., descends dorsad in the right hypochondriac region, between the transverse portion of the colon P and the concave aspect of the liver i, towards the right kidney in the renal region, then runs across in the umbilical region, beneath or dorsad to the transverse arch of the colon P, the mesocolon Q, the mesentery, the superior mesenteric vessels V, U, and emerges to become the jejunum K.

The jejunum K, bridled down by the mesentery, occupies the umbilical, the right renal, the right iliac, and hypogastric regions, and not unfrequently descends into the pelvis. This intestine imperceptibly becomes the ileum L, there being nothing to indicate their line of demarcation; the extent of intestine from the duodenum to the colon being commonly divided into five parts; the two contiguous to the duodenum constituting the jejunum, and the three contiguous to the colon constituting the ileum.

* Syn. Intestinum tenue: L'intestine grêle.

The ileum L, bridled down like the jejunum by the mesentery, is situated in the umbilical, hypogastric, pelvic, and right iliac regions, and becomes or joins the colon in the last of these divisions.

The colon, marked M, O, P, Z, in these Plates, and also in Plate V. of Part II., and in *Figs.* 2 and 3 of Plate XVIII. of Part X., begins in the right iliac region, ascends in the right renal and hypochondriac regions, then extends across in the umbilical (close to the epigastric) to the left hypochondriac, where it descends in the left renal and iliac to the hypogastric region, and becomes the rectum I, which descends along the sacrum and coccyx in the pelvis, and terminates externally at the anus I**.

Having described the course of the alimentary canal in this general manner, I shall now proceed with its structure. When investigating the pharynx in Part IX., I described only three tunics, a cellular, a muscular, and a mucous; and the same number and kind will be found to constitute the œsophagus. The alimentary tube, however, when it enters the abdominal cavity, acquires an additional coat, the peritoneal; but it may then be said to lose the cellular, for this becomes so attenuated as to be scarcely visible.—I should say, therefore, that the stomach, the small and the large intestines, consisted of a peritoneal, a muscular, and a mucous tunic. Some authors describe a nervous or vascular coat to be situated between the muscular and the villous; but this is nothing more or less than the cellular tissue which unites the muscular and villous tunics. On the same principle, we should follow the arrangement of other authors, and make the cellular tissue forming the bond of union between the peritoneal and the muscular, a distinct tunic. As these tunics vary considerably on the different viscera, I shall

defer entering more minutely at present, until I come to their individual description, and therefore proceed with the œsophagus.

The œsophagus, marked 1 in Plates I., IV., and VIII. of Part II., in Plate IV. of Part IV., in Plates I., II., III., IV., and V. of Part IX., and in Plates XV., XVI., and XVII. of Part X., I have described to be a continuation of the pharynx, beginning opposite the inferior or sacral margin of the cricoid cartilage, where there is a contraction of the tube at this point, as stated in page 14 of Part XI. The exterior cellular investment of the œsophagus is very loose, and abounds in greater quantity in some parts than in others; more so in the neck than in the thoracic cavity, where the œsophagus runs in the posterior cavity of the mediastinum, and still less so where its lateral parietes are in contact with the pleura. Its muscular fibres are chiefly spiral, a few only being either circular or longitudinal; the circular are situated at its commencement near the pharynx; the longitudinal at its junction with the stomach; and the spiral intermediate. Its mucous coat resembles that of the pharynx, of which it is evidently a continuation, but is of a white colour, and there appear fewer glandular bodies interspersed upon it, with the exception of that portion contiguous to the stomach; lacunæ or cryptæ are, however, very distinct. The extension of the cuticle is now lost to dissection, but by maceration it may be observed. After the œsophagus has entered the abdominal cavity, it acquires a coating from the peritoneum, reflected from the diaphragm, which, however, is extremely short, for the œsophagus almost immediately dilates to become the stomach. The extension of the peritoneum on each side has, however, been named ligamentum phrenico-gastricum, dextrum et sinistrum; that on the right side being continuous with the

omentum minus; while that on the left side, with the omentum majus, or the ligamentum lienis suspensorium. In the ordinary state of the body, the œsophagus is collapsed.*

The situation of the stomach,† marked b in Plate I of Part II., and in Plates XIV., XV., XVI., and XVII., *Figs.* 1, of Part X., has been already described; it consists of two apertures, an entrance named the cardiac, or œsophageal orifice,‡ marked A in *Fig.* 1 of Plates XVI. and XVII. of Part X., and an exit named the pyloric or duodenal orifice,§ marked T in the same figures; of a lesser concave arch D,‖ and of a greater convex arch *b*;¶ of an anterior or sternal surface b, in *Fig.* 1 of Plate XVI., and of an opposite, or posterior, or dorsal surface, both of which, however, vary according as the stomach is collapsed or distended; when it is fully distended, the sternal becomes the atlantal, and the dorsal, the sacral; the stomach also consists of a larger extremity or *cul-de-sac* x,** and of a smaller, marked *x*.†† Its

* The œsophagus is subject to polypi, to fungous and lobulated excrescences, to scirrhus and cancer, some of which are accompanied with stricture or constriction of the canal, and even total obstruction. It is also sometimes affected with spasmodic or permanent constrictions or stricture, producing dysphagia and dilatation, and occasionally with a protrusion of the mucous membrane through a rent of the muscular; and even both of these tunics have been protruded through a gap in the cellular envelope, so as to resemble hernia. When inflammation attacks the œsophagus, it occasionally terminates in ulceration, which sometimes extends to the lungs, to the aorta, to the trachea, and to the skin, forming, in the last case, a fistula. These diseases occur at the extremities of the canal, and more frequently at the pharyngeal than at the ventricular.

† Syn. Ventriculus.

‡ Syn. Cardia: Os ventriculi: Upper orifice: Ostium ventriculi sinistrum.

§ Syn. Pylorus: Right or inferior orifice: Ostium ventriculi dextrum seu janitor: L'orifice intestinal.

‖ Syn. La courbure supérieure: Petite courbure: Bord diaphragmatique.

¶ Syn. La grande courbure: Bord colique.

** Syn. Left extremity: Base: Fundus seu saccus cœcus: Le bas-fond, tubercle, ou grand cul-de-sac de l'estomac: Extremité splenique.

†† Syn. Right extremity: Antrum pylori: Petit cul-de-sac.

size naturally varies according to its distension; in the natural healthy state, when not filled with food, the stomach is collapsed. Its peritoneal tunic has been already described as proceeding from the omentum minus at the lesser concave arch, and extending along its two surfaces, its sternal and dorsal, where it again meets at its greater convex arch to form the omentum majus. It also receives a part of its peritoneal investment from the diaphragm along the oesophagus, and may be likewise said to receive a portion from the duodenum c. This peritoneal membrane is represented reflected off from the muscular tunic, in *Fig.* 1 of Plate XVI., and is marked a; and, in *Fig.* 1 of Plate XVIII., where the stomach is laid open, this tunic, a, is displayed throughout.

Some authors describe the peritoneum as forming various ligaments in this region; but these are so delicate and indistinct, as not to be worthy of investigation. Thus, for example, there are vinculum oesophagi; vinculum inter oesophagum et lienem; ligamentum dextrum ventriculi; ligamentum phrenico-gastricum; ligamentum gastro-splenicum.

Its muscular tunic consists of a longitudinal and transverse, or circular arrangement of fibres, the greater number being circular. This tunic is displayed in *Figs.* 1 of Plates XVI. and XVIII., and is marked b. In *Fig.* 1 of Plate XVI., the longitudinal fibres of the oesophagus l, appear to form many of both the longitudinal and circular fibres, particularly the former; and both of these fibres seem to form those of the duodenum c. At the pyloric orifice the circular fibres form a constriction, so as to enable this to act as a valve.*

The longitudinal fibres are most numerous on the les-

* Syn. Sphincter pylori.

ser concave arch D. The circular fibres appear to begin at the larger extremity X, and to extend to the pyloric orifice, where they become strongest, interlacing with each other throughout this extent, as if they were only semi-circular: some of them, however, have an oblique or transverse direction. Some authors describe a third layer of muscular fibres, to be situated beneath or centrad to these two last, and to be a continuation of the fibres of the œsophagus, running longitudinally, and interlacing with the oblique fibres.

In *Fig.* 1 of Plate XVII., the stomach is laid open from the cardiac, A, to the pyloric, T, orifice, in order to display the mucous coat *m*, which is loose, villous, and glandular, and has a reticular appearance. The mucous tunic is of a reddish rosy colour, which, however, diminishes towards the pylorus. When the stomach is empty, the mucous coat has the appearance of rugæ or plicæ, which vary in size, and run in an irregular waving transverse direction; but at the œsophageal aperture they run more longitudinally, blending with the folds of the œsophagus, of which they appear to be the continuation, and forming a stellated or radiated appearance. The epidermis investing the œsophagus cannot be traced into the stomach, for we fail to trace it further than around the cardiac orifice. At the cardiac orifice A, the lesser arch D, and the pyloric orifice T, the glands are most numerous, but most so at the pyloric orifice;* and at the pyloric orifice T, the mucous tunic is very pendulous, projecting inwards or centrad, in order to contribute to the formation of the valvular aperture T,† which, contrasted with the cardiac A, is remarkably small.

* The glandular structure of these parts of the stomach, particularly at the pyloric, are those which become affected in scirrhus and cancer of this viscus. The pyloric aperture is also the most subject to constriction or stricture.

† Syn. Valvula pylori.

The stomach is larger, wider, and shorter in man than in woman, and its muscular coat is stronger in the former than in the latter. The nervous and vascular distributions to the stomach have been described in Part II.*

The duodenum,† marked c in Plates I. and IV. of Part II., and in *Figs.* 2 of Plates XVI. and XVII. of Part X., the course of which has been already described in page 15, is the shortest and largest in diameter of the small intestines; that portion of its surface which adheres by very loose cellular substance to the vena cava ascendens, the right psoas magnus muscle, the abdominal aorta, and the spinal column, is not covered with peritoneum. The extension of the peritoneum from the duodenum to the right kidney, is named by some authors, ligamentum vel plica duodenò renalis; and these authors also describe a ligamentum duodeno-hepaticum, vel hepato-duodenale.

The muscular tunic of this intestine consists chiefly of circular fibres, which are very strong and distinct.

The mucous tunic, of a white colour, consists of a number of loose plicæ or folds, some of which are of a circular, while others are of a semilunar shape, and are arranged transversely or circularly; some being smaller or narrower than others. They are named valvulæ conniven-

* The nervous, the vascular, the glandular, and mucous structures of the stomach should be carefully investigated, in order to comprehend its diseases. These are dyspepsia, spasm, gastritis, umbilical hernia, scirrhus, cancer, fungous excrescences, fatty tumours, tubercles, polypi, constrictions, so as to divide it into two pouches, ulcers, erosions, spontaneous perforations, softening and destruction of the mucous membrane, small pouches giving lodgment to foreign substances, and hematemasis, and it is involved in cholera and fever, particularly typhus and yellow fever. In the living body, the stomach presents no contraction in its middle.

† Syn. Intestinum digitale: Intestinum rectum brevissimum: Ventriculus succenturiatus.

tes,* where the duodenum c is laid open for a considerable extent, downwards from the pyloric orifice T of the stomach b, and are displayed in *Fig.* 2 of Plate XVII. The smaller valvulæ conniventes are named by some villi, or villosities; but these villi are distinct conical prolongations of the villous tunic, situated between the valvulæ conniventes, and from which this membrane has got its name. These villi are even situated on the valvulæ conniventes, and are so numerous as to be estimated at 4000 on each square inch of the villous tunic. When examined with the microscope, they present a granulated appearance, with a number of open mouths, and are formed of lacteals and blood-vessels, connected with a cellular tissue. They have been named the ampullulæ of Leiberkuhn. Over all the surface of the duodenum, a multiplicity of mucous glands or lacunæ are found.† Between these valvulæ conniventes, a number of small glands are situated, which are named after Brunner.‡ They present a round lenticular appearance, and open with distinct mouths, and are delineated in *Fig.* 2 of Plate XVII.

In *Figs.* 2 of Plates XVI. and XVII., we perceive the ductus communis choledochus M, together with the pancreatic duct P, piercing the walls of the duodenum. In Plate XVII., where the intestine is laid open, we observe the open mouth M*, of these conjoint ducts M and P, with a papillary elongation of the mucous coat around, for in the majority of instances the pancreatic duct joins the ductus communis choledochus before its termination in the duodenum; the latter of which runs first between the peritoneal and muscular, and then between the latter and mucous tunics of the intestine, in order to act as a valve.

* Syn. Valvulæ Kerckringii.
† Syn. Cryptæ minimæ.
‡ Syn. Glandulæ solitariæ.

In Plate XVI. the duct M enters the duodenum on its dorsal aspect, near the termination of the first turn, between three and four inches from the pyloric orifice T of the stomach.

The situation and course of the jejunum K have been described in page 15. It, together with the ileum, is held in situation by the mesentery, marked Q in *Fig.* 2 of Plate XVI., and in *Fig.* 1 of Plate XIX. of Part X. This process or duplicature of the peritoneum Q, extends along the abdominal portion of the aorta and the bodies of the lumbar vertebræ, to which it adheres by cellular substance, its two laminæ enclosing the superior mesenteric artery R and accompanying vein U with their numerous branches, together with the lacteal vessels and their lymphatic glands, the superior mesenteric plexus of nerves, a quantity of cellular and adipose substances, and expanding more and more into loose folds as they advance along these vessels to surround the long convoluted extent of the jejunum and ileum. This production of the peritoneum is one of the most beautiful and wonderful productions of Nature. The small portion of root,* with the prodigious extent of ramification, is admirably arranged. The easiest manner for the student to comprehend this tortuous expanse of the peritoneum, is to return to that portion of this membrane already described in page 6, and to examine attentively and minutely the formation of the mesocolon, for the mesentery is formed identically in the same manner. Let him then trace the peritoneum a little atlantad to the brim of the pelvis, keeping the jejunum and the greater portion of the ileum out of his way, and merely allowing enough of this latter intestine to come within his examination, in

* Radix Mesenterii.

order to enable him to comprehend how the peritoneum encircles and braces it down. Where the ileum joins the colon, it is very closely braced down by the peritoneum, there being very little mesentery. After this, he may trace the peritoneum across the abdomen, so as to traverse the middle of the mesentery; and he will then clearly and perfectly understand that the latter is formed by the peritoneum from both sides of the cavity, uniting on the aorta and spinal column, descending obliquely from left to right, from the second lumbar vertebra to the right sacro-iliac-synchondrosis, and extending along the superior mesenteric artery and vein onwards to the jejunum K, and ileum L, both of which it also invests, so as to remain a continuous surface, being continuous, atlantad, dextrad, and sinistrad, with the mesocolon, and sacrad with the mesorectum and peritoneum investing the pelvis; for, as formerly remarked, the viscera are equivocally said to be without the peritoneum.*

The jejunum K is thus almost entirely surrounded with a peritoneal coat, as illustrated in *Fig.* 1 of Plate XIX., where the one lamina, a, is dissected from the other and the vessels forming the mesentery Q, and left pendulous on the intestine. When the jejunum is fully distended, we observe a distinct arrangement of muscular fibres extending along its convex arch; and precisely in the centre of these a whitish line is described to be visible, and named its ligamentary band: this, however, is so delicate and indistinct in general, as not to be worthy of such an appellation.—It is merely the mucous coat shining through. The circular arrangement of fibres is very distinct, as

* In ascites or dropsy of the abdomen, the serous fluid is contained in the pouch of the peritoneum, between its anterior or sternal portion, investing the abdominal parietes, and that which invests the small and large intestines; and hence these viscera are dorsad to the fluid.

exemplified in *Fig.* 1 of Plate XIX.; and the muscularity of the jejunum, although less than that of the duodenum, forms a striking contrast with the ileum, rendering the former much fleshier and redder in colour than the latter. The mucous coat of the jejunum so precisely resembles that of the duodenum next the jejunum, that I considered it superfluous to give a delineation of it. It is of a whitish colour, and there are fully more valvulæ conniventes in the beginning of the jejunum, but rather fewer solitary glands; the glandular bodies being in oblong clusters, and named plexus glandulosi Peyeri. The villi are also more loose and pendulous. The mucous glands or lacunæ are the same.

The ileum L constituting the remaining three-fifths of the small intestine from the beginning of the jejunum, has been so far described in pages 15, 17, and 23. It differs from the jejunum in being much thinner in its muscular and mucous coats, as exemplified in *Fig.* 1 of Plate XVIII. Its peritoneal tunic has been already described in page 23, together with that of the jejunum.

Both the longitudinal and circular plane of muscular fibres are very indistinct. The colour of the mucous tunic becomes paler, and the valvulæ conniventes become more and more indistinct in the ileum as we advance towards the colon; and, as delineated in *Fig.* 1 of Plate XVIII., there are none in that portion of the ileum: here they are considered by some to run longitudinally. The villi of the ileum are longer, thinner, and more conical than those of the jejunum or duodenum, and are also more remote or apart from each other. The mucous glands or lacunæ are the same. The larger series of glands resemble those of the jejunum, being arranged in clusters, and also named after Peyer; and near the colon they are most numerous, and frequently of considerable

extent, as represented in *Fig.* 1 of Plate XVIII., where, on the mucous tunic *m*, they form irregularly shaped patches. These are found almost exclusively on the sides of the ileum, and not on the convex or concave arches. The nervous and vascular distributions to the small intestines have been described in Part II.*

The colon,† marked M, O, P, *z*, in Plates IV. and V. of Part II., and in Plates XIV. XV. and XVIII. of Part X., has been described, as far as regards its situation, in page 16. It is divided into its caput cœcum M, its ascending portion O,‡ its transverse portion P,§ and its descending portion or sigmoid flexure *z*,‖ with its appendix vermiformis 29. The caput cœcum is the commencement, or that portion which is sacrad or rather distad to the ileum L, and will be best understood by examining *Fig.* 3 of Plate XVIII., where all that is to the right of L and *v* in reference to the observer, is the caput cœcum. The ascending portion O beginning above or atlantad to the caput cœcum, and the junction of the ileum, ends where the intestine advances to the liver i. The colon now begins to extend across, becoming then the transverse portion P, which terminates near the spleen

* The nervous, vascular, glandular, and mucous structures of the small intestines, should be carefully examined in order to comprehend their diseases, as spasm, volvulus, diarrhœa, cholera, constipatio, enteritis, ulceration, mortification, scirrhus and cancer, tabes mesenterica, tubercles, fungous excrescences, fatty tumours, perforations, adhesion to each other, ossification, and hernia. A peculiar malformation occasionally exists in the course of the ileum, a conical projection or prolongation like the finger of a glove originating from its convex arch, named diverticulum; I have seen these four inches long, and they are by no means uncommon. Syn. Diverticule ilial. The tænia, the lumbricus, and the trichuris, species of worms, are found in these intestines.

† Syn. Intestinum crassum.

‡ Syn. Intestinum colon dextrum seu ascendens.

§ Syn. Colon transversum.

‖ Syn. Intestinum colon descendens; Flexura sigmoidea seu iliaca, seu S romanum.

F, where the colon begins to descend and form the sigmoid flexure z, which ends in the rectum I. Some authors make a still more minute division of the colon, as, for example, caput; cœcum; ascending part of the arch; transverse part of the arch; descending part; and sigmoid flexure. The colon is held in this extensive course by the omentum majus and mesocolon, the latter of which is marked Q in Plate IV. of Part II., and part of which has been described in page 6, *viz.* that portion which binds down the sigmoid flexure z. In some subjects the peritoneum here does not encircle the colon so as to form a mesentery, but only invests that portion of the intestine which is free, a considerable part in such a case adhering by loose cellular substance to the iliacus internus and psoas magnus muscles.* At the caput cœcum, and the commencement of its ascending portion, this deficiency of peritoneal covering and extensive loose adhesion to the muscles is still more frequently the case. Near the right kidney the mesocolon is named the right ligament of the colon, and near the left kidney the left ligament of the colon. The mesocolon is loose and free where it supports the transverse portion, and it is here that it contributes to form the large omental pouch.

That portion of the mesocolon which binds down or supports the ascending portion of the colon is named by some, *le mésocolon lombaire droit*; the transverse portion, mesocolon transversum, and the descending, *le mésocolon descendant*. The mesocolon, as already mentioned, is, like the mesentery, a process of the peri-

* I have been thus particular in describing this portion of the peritoneum, in consequence of this part of the colon, and its caput cœcum, being occasionally forced out in hernia without having a peritoneal herniary sac. When the peritoneum is forced out so as to form a herniary sac, it becomes, on some occasions, greatly elongated, sometimes rendered thicker by an acquisition of cellular substance, and sometimes thinner from over distension.

toneum, and, like it, consists of two layers. In Plate IV. of Part II. we observe it, marked Q, joining the mesentery on its sinistral aspect, and confining the duodenum C, the course of which is indicated by dotted lines, and from thence extending dextral along the ilio-colica *t*, and colica dextra *u* arteries, onwards to the ascending portion of the colon O. This part of the mesocolon adheres firmly to the vena cava ascendens, the psoas magnus and iliacus internus muscles, and admits of no latitude of motion. We perceive also the mesocolon ascending along the colica media artery V, uniting with its opposite lamina, which descends along the pancreas D to support the transverse portion P of the colon. This part of the mesocolon is remarkably loose and free. On the transverse and beginning of the descending portions of the colon, or, in other words, on those portions of the colon which are loose and free, small peritoneal prolongations filled with adipose substance project, which are termed appendices epiploicæ.* These, however, are only observable in fat subjects, for in emaciated ones little or no trace of them is to be found. In *Fig.* 2 of Plate XVIII. there is a process of the peritoneum, marked *l*, extending between the ileum L and the caput cœcum M, connecting these together, and also giving support to the appendix vermiformis 29.

The colon has, besides its three tunics, like the other intestines, three longitudinal muscular bands, marked T in *Figs* 2 and 3 of Plate XVIII., which extend along its walls at equal distances, one of them being hid by the laminæ of the mesocolon. These muscular bands are the longitudinal muscular fibres of this intestine congregated in this peculiar manner; still, however, we can perceive

* Syn. Omentula intestini crassi.

some insulated longitudinal muscular fibres here and there between these three bands. They commence or unite at the appendix vermiformis 29, and terminate in forming the longitudinal fibres of the rectum. These bands purse the colon into these peculiar pouches or cells* so characteristic of this intestine; for when these bands are dissected off, the colon expands to double its natural size, and becomes regularly and uniformly cylindrical. The circular muscular fibres of this intestine are very sparse and thin, being more so than those of the small intestines.†

The mucous tunic, of a very pale white colour, presents a number of depressions and elevations, which make it appear at first sight that this membrane is loose and free; the depressions have a reticular or honeycomb appearance, somewhat similar to that of the stomach; and the little elevations which separate these, occupy the greater space, and resemble the villi of the small intestines. We observe also a multiplicity of mucous glands studding this mucous tunic, as delineated in *Fig.* 3 of Plate XVIII.‡

In *Fig.* 3 of Plate XVIII, the valve of the colon,§ marked with the letters *v*, is displayed, which is formed by the ileum extending into the colon, the two productions or folds *v*, *v*, consisting of the mucous and muscular coats of both the ileum and colon, those of the latter being reflected inwards; but only the circular muscular fibres of the ileum are concerned, the longitudinal fibres with the peritoneal coat running on the colon. These folds *v*, *v*, are of a semilunar shape, like the valvulæ conniventes, are

* Syn. Cellulæ seu haustra.

† The colon, particularly its sigmoid flexure, is very subject to constrictions or stricture.

‡ The sigmoid flexure, of all the portions of the colon, is the most subject to scirrhus, and cancerous ulceration, accompanied with stricture, and even total obstruction, producing great dilatation in the upper portion of the intestine.

§ Syn. Valvula vidi vidii: Valvula Bauhini: Valvula ileo-colica.

extremely loose and floating, and run sternad and dorsad, or forwards and backwards, meeting with each other so as to form two commissures. The atlantal or superior is narrower than the sacral or inferior, situated nearly horizontal, and forms almost a right angle with the ascending portion of the colon. The inferior or sacral is larger, and describes a more acute angle with this portion of the colon. These folds *v* overlap each other, and, when separate, they form an elliptic aperture of considerable magnitude, fully the size of the ileum.*

The appendix vermiformis, marked 29 in Plate IV. of Part II., and in *Figs.* 2 and 3 of Plate XVIII. of Part X., is a peculiar funnel shaped prolongation of the colon at its caput cœcum, generally about three inches long, and is therefore the shortest and narrowest portion of the alimentary tube. In the connected state, it is generally hid by the caput cœcum and ileum, and has a short narrow mesocolic production which binds it down, and gives it a tortuous appearance. It possesses peritoneal, muscular, and mucous tunics, like the rest of the alimentary canal. Its muscular coat is formed by the termination, or commencement of the three longitudinal muscular bands of the colon. It commences by an open mouth, at the beginning of the caput cœcum, as represented in *Fig.* 3 of Plate XVIII., where there is a number of mucous glands, which are still more numerous on the mucous tunic of this appendix. Morgagni describes a sort of transverse fold or species of valve being found at the mouth of this appendix, but this I have never observed.

The nervous and vascular distributions to the colon have been described in Part II.†

* The attachments and configuration of these folds, together with the direction of this aperture, should be considered with regard to overcoming the obstacle offered by them, when employing enemata in volvulus.

† The extent of the cœcum, which is about an inch and a half from the ileum,

The course of the rectum, the widest in diameter of the intestines, has been already generally described in page 16, and marked I, in Plates V. and VI. of Part II., in Plate XIV. of Part III., in Plates XIV. and XV. of Part X., in the last of which the I, has an asterisk* after it, and in Plates V. and VI. of Part XI. In the female subject, it is observed to descend behind, or sacrad to the uterus k, and the vagina D, adhering intimately to the latter, but in no degree with the former;* and leaving the vagina where the perineum E, Plate III. of Part XI., intervenes, this space being occupied by the sphincter vaginæ N, sphincter ani r, and levator ani s muscles, as represented in Plate IV. of Part XI. together with the integuments, and cellular and adipose substances. In this course the rectum adheres by cellular substance to the os sacrum B, and os coccygis, being in its extent from the promontory of the sacrum to that part where it is not invested with the peritoneum, a little sinistrad from the mesial line; but from the part uncovered with the peritoneum to its forming the anus, as that marked I* in Plate V. of Part XI., it runs precisely in the mesial line.

As delineated in Plate VI. of Part XI., the peritoneum *a*, is observed to extend along the rectum I, encircling it for some extent a little beyond or coccygead to the os uteri R, when it stops, and from thence re-ascends to be reflected on the sacral aspect of the uterus k. The lateral folds of this inflection or cul-de-sac, which run somewhat longitudinally, are named plicæ semi-lunares. At the

together with the cells of the colon, should be carefully examined in their relation to the lodgement of scybalæ, to constipation, cholera, and dysentery. And the nervous, vascular, and mucous structures of the colon should be examined, in reference to these diseases, and also to diarrhœa, spasm, enteritis, tubercles, and hemorrhage. Calcareous concretions are sometimes formed in the colon.

* In extirpation of the uterus, the non-connexion of the uterus with the rectum should be kept in view.

promontory of the sacrum, and for a little extent downwards in the pelvis, the rectum is so encircled with the peritoneum, that there is a mesentery here formed, named mesorectum; a short distance, however, before the peritoneum is reflected on the os uteri, this membrane only clothes the anterior or pubic aspect of the rectum; coccygead to this, the rectum, marked I*, is totally divested of a peritoneal tunic.

The muscular fibres of the rectum are remarkably numerous and strong, are arranged longitudinally, being the continuation of those fibres forming the longitudinal muscular bands of the colon, and are represented in Plates V. and VI. of Part XI.; there are also circular muscular fibres,* situated beneath or centrad to these longitudinal ones.

In the male, the course of the peritoneum is different; it does not encircle the rectum so far coccygead, but invests only its pubic aspect, as represented by the white line extending between the rectum I, and the bladder m, in Plate XIV. of Part III.; and from the rectum I, it is reflected on the urinary bladder m, and ascends to its fundus; this fold or doubling of the peritoneum being named the cul-de-sac.†

The rectum proceeds along the coccyx, covered by the levator ani muscle r, and projecting beyond the coccyx, is covered and supported by the sphincter ani muscle s, and terminates in forming the anus I**, the mucous membrane here uniting with, or running into the cutane-

* The rectum, from its muscularity, is subject to both spasmodic and permanent stricture.

† This inflection of the peritoneum should be duly considered by the operator in puncturing the urinary bladder, and in the recto-vesical operation for calculus in the bladder.

ous.* The mucous membrane, of a whitish colour near the colon, becomes slightly rosy near the anus, is loose, and studded with simple mucous glands,† which, however, are not very numerous.

I shall now proceed to the description of the fixed viscera, beginning with the liver.

The liver,‡ marked with the letters i in Plates I. and IV. of Part II., and in Plates XIV. XV. XVI. and XVII. of Part X., is the largest conglomerate gland in the body, is situated in the right hypochondriac the epigastric and in the left hypochondriac regions; and is observed to extend more into the left hypochondriac region in woman than in man. In the fetus, the liver bears a considerably larger proportion to the other viscera, than in the adult. The liver descends much lower or sacrad on the right than on the left side; its right extremity rests on the right kidney, its left on the stomach near its cardiac orifice, while its free margin floats on the stomach, duodenum, and colon, extending outwards or periphero-sacrad nearly to the sacral margins of the cartilages of the last true and all the false ribs of the right side. It is held in this situation by duplicatures of the peritoneum, which are named the ligaments of the liver. In early age onwards to the meridian of life, the colour of the liver is a reddish-brown; but after this

* Children are not unfrequently born with an imperforated anus, in which case the rectum terminates in the male either an inch or two from the anus, or in the urinary bladder, or in the urethra; and in the female, in the vagina, or within an inch or two of the anus. The accoucheur should, therefore, be on his guard for such malformations, and both he and the operator ought to make themselves perfectly masters of the pelvic viscera and their blood-vessels.

† These glands are very subject to disease, viz. to inflammation and suppuration, to tubercles, to stricture, to scirrhus, and cancer.

‡ Syn. Hepar: Jecur.

period, it progressively becomes darker in colour. The peritoneum a, a, after investing the diaphragm B, B, as delineated in *Fig*. 2 of Plate XVI. of Part X., unites in the mesial line of the body, beneath or centrad to the linea alba, from the umbilicus onwards near to the middle of the diaphragm, to form the suspensory ligament* A, of the liver, which is further strengthened at its free margin by the round ligament† C. These descend centrad or dorsad in the liver between its two great lobes I, i; the suspensory ligament A, again expanding on the convex aspect of the liver to become the peritoneal envelope of this organ. The round ligament C, which was the umbilical vein in the fetus, is also surrounded with the peritoneum, begins at the umbilicus, and descends between the two great lobes I, i, to become incorporated likewise with the peritoneal investment of the liver. When we reflect downwards or sacrad the sternal margins of the two lobes I, i, of the liver, so as to remove them a little from the diaphragm B, we find the peritoneum a, proceeding from the one organ to the other; and this angular fold, or angle of inflection of the peritoneum, is termed the coronary ligament of the liver. A considerable portion, therefore, of the liver adheres to the diaphragm through the medium of cellular substance; hence this viscus, like the intestines, is not entirely surrounded with the peritoneum. At the left extremity of the liver, where it projects into the left hypochondriac region, the peritoneum forms a loose doubling like the suspensory ligament, which extends between the left lobe of the liver i and the diaphragm B, and is denominated the left lateral ligament of the liver,‡

* Syn. Ligamentum latum: Ligamentum suspensorium: Ligamentum falciforme: Suspensorium hepatis: Middle ligament of liver.

† Syn. Ligamentum teres: Umbilical ligament.

‡ Syn. Le ligament triangulaire gauche.

and is marked E. A similar ligamentous production extends between the right lobe I and the diaphragm B, which is named the right lateral ligament.* Other ligaments are described by authors, as the ligamentum hepato-colicum, which is a production of the peritoneum, extending from the gall bladder along its duct, and the duodenum to the colon: this, however, is the result of disease. A ligamentum hepato vel hepatico-renale, or plica hepatico-renalis, which connects the root of the right lobe of the liver to the right kidney, is also described; but this portion of the peritoneum is flat and adherent, and not entitled to the appellation of ligament. The peritoneum invests all the surface of the liver, with the exception of those points already described, and where the gall bladder e rests, and also where the liver rests on the vertebral column, or rather on the crura of the diaphragm, and likewise where the vena cava runs, as will be understood by examining Plate XV.

The liver consists of a convex surface pointing towards the diaphragm B, and of a concave surface I, i, towards the other abdominal viscera; of a free thin margin, which points sternad and peripherad, and of a fixed thick margin pointing dorsad; of a right and a left extremity; of two distinct lobes, a right one marked I, and a left i, with an accessory one to the right, termed the lobulus Spigelii, and marked k. Authors, however, describe a lobulus caudatus,† which is merely the connecting isthmus between the right lobe I and the lobulus Spigelii k, and is marked Y in *Fig.* 2 of Plate XVII.; and a lobulus quadratus vel anonymus,‡ which is the gentle elevation

* Syn. Le ligament triangulaire droit.

† Syn. Processus caudatus.

‡ Syn. Lobulus accessorius: Lobulus anterior.

between the gall bladder e and the pons hepatis H, and is marked G in *Fig.* 2 of Plate XVI.

The right lobe I, situated dextrad of the round ligament c, lies in the right hypochondriac region, is much the largest, being nearly four times larger than the left, forming all the lesser lobes, and occasionally almost the whole bulk of the liver. Between the right I and left i lobes, or, if we make a quadratus, between the quadratus G and the left lobe i, there is a small square portion of the liver, marked H, named the pons hepatis,* extending over the sulcus between the right and left lobes, which sulcus, marked V in *Fig.* 2 of Plate XVI., lodges the round ligament c that was the umbilical vein in the fetus, and hence termed fossa umbilicalis.† The continuation of this umbilical fossa downwards between the lobulus Spigelii and the left lobe, is named fossa ductus venosi,‡ from lodging this vein, one of the continuations of the umbilical vein in the fetus; while the whole extent of this sulcus, or both of these just enumerated, is named by some, fossa longitudinalis sinistra. The pons hepatis is frequently deficient.

The lobulus Spigelii k,§ is merely a projection of the right lobe, and with the quadratus G forms what is named the porta, which gives entrance to the vena portæ N, together with the hepatic artery q, and exit to the hepatic duct *f*. The hepatic plexus of nerves and lymphatic vessels also pass and repass here. The space bounded by the lobulus Spigelii k and quadratus G which are opposite each other, and by the diagonal points, the cau-

* Syn. Isthmus hepatis.

† Syn. The great fissure: Horizontal fissure: Fossa anterior, longa, longitudinalis: The great scissure: Fovea pro vena umbilicali, seu ligamento terete.

‡ Syn. Sulcus ductus venosi: Left fissure: Posterior fissure.

§ Syn. Lobulus posterior; Lobulus papillatus.

datus Y and contiguous projection of the left lobe,* and all of which surround these vessels and ducts, is denominated the sinus of the vena portæ.†

On the dorsal aspect of the right lobe, between it and the lobulus Spigelii, as represented in *Fig.* 2 of Plate XVII., a conspicuous depression or sulcus is observable, which is occupied by the vena cava ascendens, that frequently is imbedded in the substance of the liver at this part, and is termed fissura venæ cavæ.‡ In Plate XV. of Part X., which is a posterior view of the thoracic and abdominal viscera, the vena cava *i* is seen running imbedded in the substance of the liver marked i; there is, therefore, here no peritoneal investment. The vena cava is joined, during its passage along the liver, by the venæ hepaticæ, which open generally with eight mouths, as described in page 22 of Part II. A little sinistrad of this last sulcus, on the dorsal aspect between the right and left lobes, a very gentle depression is observable, made by the spinal column, but from the diaphragm intervening, this depression is always very slight; there is here also no peritoneal covering.

The only other depression is that made by the gall bladder e on the concave aspect of the right lobe, dextrad of the lobulus quadratus G, as delineated in *Fig.* 2 of Plate XVI. In Plate XVII. the gall bladder is removed from its depression, which is marked W,§ and is not invested

* This projection of the left lobe is named by some authors, lobulus lobi sinistri.

† Syn. Sinus portarum: Sulcus transversus: Principal fissure: Sulcus intermedius seu transversus.

‡ Syn. Fossa venæ cavæ.

§ Syn. Fovea fellis: Vallicula vesiculæ felleæ: Fossa pro vesicula fellea. By some the depression of the gall bladder, and that for the vena cava, is considered as one fossa, and named fossa longitudinalis dextra.

with peritoneum, this membrane gliding from the liver over the exposed surface of the gall bladder, in order to retain the latter in its situation. In the fetus, the gall bladder projects more out from the liver than in the adult. The right kidney generally makes a slight indentation on the right lobe.

The vena portæ, marked N, n, *n*, in Plate IV. of Part II., and in *Figs*. 2 of Plates XVI. and XVII., has been already described in Part II. page 21, and so also have the hepatic veins in page 22, and the hepatic artery q in page 18. In page 22 of Part II. the vena portæ N is described onwards to its division in the substance of the liver. In a successful injection, its minute branches are found to consist of two series, a smaller and a larger; the larger is subdivided ultimately into vessels about a line in diameter, which communicate directly with the commencements of the hepatic veins, already described in page 22 of Part II. The smaller and much more delicate branches can be traced to the pori biliarii, or the commencements of the hepatic ducts, which do not inosculate with them. These terminations of the vena portæ are named penicilli. Some of these delicate branches proceed to the cortical substance of the liver.

On making a section of the liver, or in tracing the vessels and ducts into its substance, as delineated in *Fig*. 2 of Plate XVI., besides the ramifications of the vena portæ, the hepatic artery, the hepatic veins, the hepatic nerves, lymphatics, and the hepatic duct, together with a quantity of cellular substance, we perceive that it consists of two textures mingled together, the one alternating with the other. At first sight they appear to consist of undulating bands about half a line in thickness, but on more minute investigation, the yellowish coloured texture forms a coherent mass interspersed throughout, and producing a multitude of ele-

vations and depressions, at the same time that there occurs a number of interruptions, thus forming a very complicated structure. This is compared to the medullary structure of the brain or kidney, and if more minutely examined, consists of small points or grains. In these intervals or gaps, which are scarcely a line in diameter, and of a polygonal starry shape, a much softer and less transparent texture is found, which is compared to the cortical structure of the brain or kidney. The smallest collections of these two textures are named lobuli, or acini.

The hepatic duct* *f*, in Plate IV. of Part II., and in *Figs.* 2 of Plates XVI. and XVII., is observed to be formed in the last of these plates by a multiplicity of smaller ducts, which accompany the subordinate branches of the vena portæ, and concentrate in the first instance into two large branches, and secondly into one trunk. The one branch proceeds from the right, and the other from the left lobe of the liver. The minute commencements of these smaller biliary or hepatic ducts are named pori biliarii, and seem to begin where the medullary and cortical substances unite; for they are never found to originate from the surface, but always from the interior of the liver. The hepatic duct *f* emerges from the liver at the sinus portarum, and after a short course is joined by the cystic duct *e*, the union of which constitutes the ductus communis choledochus M,† that proceeds sacrad and dorsad of the duodenum c, the coats of which it pierces between three and four inches from the pyloric orifice T of the stomach, as described at page 23. The ductus communis choledochus M, together with a portion

* Syn. Ductus excretorius hepatis.

† Syn. Common duct; Ductus choledochus; Ductus hepatico-cysticus.

of the cystic *e* and hepatic *f* ducts, the vena portæ N, the hepatic artery q, the hepatic plexus of nerves, and the lymphatics of the liver, are all enveloped in a production of the peritoneum, which unites them together. That which more immediately surrounds the vena portæ, the hepatic artery, and hepatic duct, and accompanies them into the substance of the liver, is named the capsule of Glisson, which has been already described in page 22 of Part II.

The cystic duct *e* is observed in *Figs.* 2 of Plates XVI. and XVII. to be the excretory tube of the gall bladder e, the latter of which is situated in a depression w on the concave surface of the right lobe I of the liver. The gall bladder,* of a pyriform shape, consisting of a fundus or its larger round bulbous extremity, a body or middle, a cervix or its narrow contracted extremity, and a mouth contiguous to this latter, is thus imbedded in the liver, and retained by the peritoneum gliding from the right lobe I over the gall bladder e to the lobulus quadratus G, as illustrated in *Fig.* 2 of Plate XVI. It has thus a partial peritoneal coat. Beneath or centrad to this there is a delicate muscular tunic, the peripheral or outer surface of which is of a whitish colour, and throughout which a number of blood-vessels are found distributed. Underneath this muscular tunic there is a mucous coat, presenting an elegant reticular appearance, the figures of which are irregular pentagons, resembling that of the stomach. Small apertures are perceptible over this mucous surface, which are the mouths of glandular lacunæ or small mucous glands. Transverse folds are described by some authors as being found at the neck of the gall bladder, and in the cystic duct, having their

* Syn. Cystis: Vesicula fellea: Chole-cystis: Cystis fellis: Vesicula.

free edges pointing to the gall bladder; but these seem to be merely the free folds of the cells accumulated, and have a longitudinal or spiral more than a transverse direction. Neither the cystic nor the hepatic duct appear to possess muscular tunics. Both of them have a peritoneal, a condensed cellular analogous to a muscular, and a mucous coat. In the interior of the liver the hepatic duct has merely the condensed cellular and mucous coats. Both the hepatic and common choledoch ducts have smoother mucous tunics than the cystic, and have numerous mucous lacunæ opening into them.*

The spleen, marked F in Plates I. and IV. of Part II., in Plates XIV. and XV., and in *Fig.* 2 of Plate XVI. of Part X., is an oblong shaped viscus, of a dark purple colour, situated in the left hypochondriac region, between the left extremity of the stomach and the diaphragm, and held in this situation by the peritoneum reflected from the diaphragm, from the pancreas along the vessels of the spleen, from the stomach and colon through the medium of the omentum majus and vasa brevia, and also from the left kidney. In some cases the omentum majus extends from the œsophagus along the great arch of the stomach to the spleen, and this portion has been named by some authors, vincu-

* The relative situation and the structure of the liver, together with its circulation and secretion, should be carefully investigated and considered by the practitioner, as it is subject to many diseases. It is involved more or less in all the affections of the stomach, and in every variety of fever. Its function of secretion is affected by every kind of diet, and every variation of the weather. It is concerned in icterus, and very easily ruptured by a fall or a blow; it is subject to hepatitis, acute and chronic, to hepatocele, abscess, ulceration, scirrhus, cancer, tubercles, hypertrophy, induration, softening, conversion into adipose substance, and to ossification of its investment. Its ducts are subject to spasmodic and permanent stricture, to obstruction, and to calculi. The gall bladder is occasionally deficient, and in some instances a double gall bladder has been found.

lum inter œsophagum et lienem. The extension of the peritoneum from the spleen to the kidney is also termed by some, plica renalis et capsularis. But sometimes we find these productions of the peritoneum remarkably delicate, while at others of some strength, but on no occasions so strong as to entitle them to the appellation of ligaments. The spleen is thus invested with a peritoneal tunic, and beneath or central to it is a fibrous coat, with which it is so intimately united as to be incapable of separation, excepting at the fissure where the blood-vessels enter its substance, and even there only for a very trifling extent. The surface of the spleen which is opposed to the diaphragm is convex, while that which rests on the left extremity of the stomach is concave, an acute margin forming the limits of these two surfaces. This margin is sometimes notched, as in *Fig.* 2 of Plate XVI. On the concave aspect we observe a fissure, by which the blood-vessels enter, surrounded with a quantity of cellular and adipose substances. The splenic artery r, and its accompanying vein *s*, have been already described in page 18 of Part II. onwards to their entering this viscus; and in *Fig.* 3 of Plate XVI. of Part X. these vessels are developed onwards to their distribution into the substance of this organ. The artery divides into a number of ramifications, which terminate in the most delicate twigs, grouped like the hair of a paint-brush, without inosculating. The veins are arranged around these arterial bundles, anastomose frequently with one another, and with those in their contiguity.

Its texture is remarkably soft and delicate, and appears to be entirely formed of blood-vessels; there is, however, a multitude of lamellæ and delicate fibrous prolongations proceeding from its fibrous investment, interwoven in a

variety of ways, leaving irregular intervals for the distribution of the blood-vessels. There are also a multiplicity of white round soft corpuscles, plentifully supplied with the blood-vessels. The nerves distributed on the spleen have been already described in Part II. It has also a number of lymphatics.*

The pancreas, marked D in Plate IV. of Part II., in Plate XV., and in *Fig.* 2 of Plate XVI. of Part X., is an oblong shaped flattish conglomerate gland, situated in the epigastric and left hypochondriac regions, and extending transversely across the spinal column, having the stomach on its sternal, and the second last dorsal vertebra on its dorsal aspect, and the liver on its dextral, and the spleen on its sinistral aspect, and encircled by the convolutions of the duodenum. It has been compared in shape to the tongue of the dog, the root being its right or duodenal extremity, and the apex its left or splenic extremity; having also an anterior or sternal surface compared to the dorsum of the tongue, and a posterior or dorsal surface compared to the inferior surface of the tongue; likewise two sides or margins, an upper or atlantal, and a lower or sacral; and lastly, a body or central portion. Its sternal or anterior surface is invested with the peritoneum, while its posterior or dorsal aspect adheres by cellular substance to the duodenum, the vena portæ, the superior mesenteric artery and vein, the splenic artery and vein, the aorta, the crura of the diaphragm, and the atlantal extremity of the left kidney.

* The delicate structure of the spleen should be considered by the practitioner, as it is easily ruptured in falls or by blows. It is involved in all affections of the stomach and liver; is subject to hypertrophy, splenitis, splenocele, scirrhus, tubercles, induration, and to ossification of its membranes. Appendages of the spleen, named accessory, not unfrequently exist, and are situated on its concave aspect, near its inferior or sacral extremity.

It has, therefore, only a partial peritoneal tunic, but a complete cellular one, the cellular membrane running beneath the peritoneal tunic. By some it is compared to the figure of a hammer, and is described as being situated between the folds or laminæ of the mesocolon, but this is evidently incorrect.

The pancreas is of a yellowish-brown colour, and precisely resembles the parotid and other salivary glands. On first examination, it is of a pretty firm consistence; but its lobes may be divided into grains, or granulæ, or acini of extreme tenuity, which are only held together by a very loose cellular tissue.

On making a longitudinal section of the pancreas, as delineated in *Fig.* 2 of Plate XVI., a long white duct* is displayed running throughout its whole length, beginning at its sinistral extremity, by several smaller ducts uniting at an acute angle, and being joined in its progress by a multiplicity of other small branches at a right angle; it terminates in the duodenum c, either by one or two tubes, or joins the ductus communis choledochus M, immediately at its termination in the duodenum; the latter of which is the more common occurrence, as described in page 23. Some are of opinion that the large pancreatic duct never enters the common choledoch duct, but runs on its left side separately, onwards to the duodenum, passing, like the biliary duct, between its coats. This duct joins occasionally the duodenum, nearly ten inches distant from the pylorus. The pancreatic duct has been found occasionally double throughout. Near its termination in the duodenum, it generally receives one or two conspicuous branches from that portion of the gland attached to the duodenum, which is named by some authors the head of the gland, and by others, the pancreas minus. These smaller ducts,

* Syn. Ductus pancreaticus: Ductus Wirsungianus.

however, occasionally terminate separately in the duodenum. When we trace the small ducts which feed the large one, we find them originating at the small grains.* The nerves and blood-vessels of the pancreas have already been described in Part II., pages 19, 22, and 29.

The kidney, marked Y, in Plate V. of Part II., in Plate XV., and in *Figs.* 2 and 3 of Plate XIX. of Part X., is a large conglomerate gland of the shape of the French bean (phaseolus), situated in the renal or lumbar region, between the last or twelfth rib and the crista of the os ilium, the right kidney being placed a degree lower or more sacral than the left, in cônsequence of the situation of the liver. It is situated dorsad, or behind the peritoneum, between it and the psoas magnus and quadratus lumborum muscles, adhering to all of them by loose cellular substance. The kidney occasionally extends on the left side so high as the eleventh or even the tenth rib, but on the right seldom higher than the eleventh.

The kidney has a convex lateral and a concave mesial margin, with a concavity or fissure at the latter ;† an upper or atlantal, and a lower or sacral extremity ; an anterior or sternal, and a posterior or dorsal surface. At its atlantal extremity there is a glandular tissue, marked *y*, in Plate XV. of Part X., named capsula renalis ;‡ and at its concave mesial margin the renal artery C, with its accompanying vein, and the ureter w, enter and emerge, and there is a quantity of adipose and loose cellular substances found here. The peritoneum merely glides over the sternal surface of the kidney, there being inter-

* The pancreas is involved in scirrhus and cancer of the stomach, occasionally in diseases of the liver and spleen, and is subject to hypertrophy, induration, scirrhus, and cancer. Calcareous concretions have been found in its duct.

† Syn. Hilus renalis : Scissure du rein : Bosom of the kidney : Fissure of the kidney : Sinus of the kidney.

‡ Syn. Glandula atrabiliaris.

posed a quantity of adipose substance; a profusion of loose cellular tissue surrounds the whole of the kidney, constituting its cellular tunic;* and beneath or centrad to this is a white fibrous membrane, rough on both its surfaces, closely investing also the whole of the gland which is named its tunica propria. By some authors this membrane is not allowed to be sensibly fibrous, but only to be very solid, and approach very closely to fibrous membranes.

The kidney consists of two textures, a cortical,† marked B in *Figs.* 2 and 3 of Plate XIX., and a medullary, ‡ marked p^* in the same figures. The cortical substance B, completely encircles the medullary p^*, and even sends prolongations between the various papillæ p^*, which constitute the medullary structure, to the concavity of the gland. The cortical is of a lighter red than the medullary, of a softer consistence, and consists almost entirely of blood-vessels and glandular corpuscles,§ which are the commencements of the tubuli uriniferi.

The arterial vessels are exceedingly delicate,—they encircle and penetrate the glandular corpuscles, which are of various figures, being either round, quadrangular, pentagonal, or hexagonal; and the commencements of the tubuli uriniferi here begin, being connected with the blood-vessels by a soft whitish cellular tissue. These tubuli ‖ are small, of a whitish colour, and very flexuous, forming a diversity of figures, inosculating freely with each other, and running for the most part insulated, but sometimes united in pairs.

* Syn. Membrana seu capsula renum adiposa.

† Syn. Substantia corticalis, seu glandulosa, seu secernalis.

‡ Syn. Substantia medullaris, seu tubulosa, seu fibrosa, seu sulcata, seu striata, seu urinifera; la substance cannelle, ou sillonnée.

§ Syn. Corpora globosa: Acini: Globuli arteriarum termini.

‖ Syn. Canales corticales: Conduits de Ferrein.

The medullary texture, marked with the letters p^*, consists of a number of conical or pyramidal bodies, varying from seven to twenty in number, with their bases pointing peripherad and their apices centrad towards the pelvis P of the kidney; the latter, or apices p, being named papillæ uriniferæ.* These medullary cones p^*, nearly approximate each other, space being merely left for the blood-vessels to proceed to the cortical substance. This medullary substance is darker in colour, firmer, and harder than the cortical; it has fewer blood-vessels, consisting chiefly of straight uriniferous tubuli,† the continuation of the flexuous tubes in the cortical substance, which are now more concentrated, and consequently larger, and which run parallel with each other onwards to the papillæ p, where they terminate by small apertures, either in a depression in the centre of the papillæ p, or around these projections, from which, in a recent kidney, the urine may be with facility pressed out. In the majority of cases, the small depression is observable in the centre of the papillæ, in which the foramina, the mouths of the tubuli uriniferi are perceptible. Sometimes these cones are quite distinct at their bases, but are united at their apices.

The papillæ uriniferæ p, are encircled by a large common membranous pouch, marked P, named the pelvis of the kidney, which is laid open in *Fig.* 3, bringing into view the manner in which these papillæ project into the cavity of the pelvis, and how each is surrounded with a loose fold of this membrane, termed its calyx, and the prolongation of which, towards the pelvis, together with the calyx, is styled infundibulum. These views are from the

* Syn. Papillæ renales: Substantia papillaris: Processus mammillaris: La substance mammelonnée.

† Syn. Ductus seu tubuli Belliani, seu renales.

kidney of a subject about ten years old, and in which the infundibuli are not so well developed as in the adult. The pelvis, also, is not just so broad. The papillæ themselves have a very delicate extension of the membrane constituting the calyx spread over them. The pelvis, which is simply the accumulation of the infundibuli, or an enlargement of the ureter W, immediately on its emergence from the concavity of the kidney, contracts to form the ureter W; the course of which I shall defer tracing until I have described the vessels and capsula renalis. The renal plexus of nerves has been described in page 30 of Part II., and the renal artery in page 23 of the same Part, onwards to the concave aspect of the kidney, where it divides into branches which run around and exterior to the pelvis P, and proceed between the medullary cones *p**, outwards to the cortical substance B, where they subdivide and form arches turned towards each other, encircling and disposed in rays of most minute vessels around the glandular corpuscles, which they appear to form. The arterial branches, in their progress between the medullary cones, and even after they have formed the arches, do not inosculate. It is only the minute filaments disposed around the corpuscles which anastomose.*

* One or both kidneys are sometimes deficient; both have been found in the pelvic cavity; one of them is often much larger than the other; both are occasionally considerably larger than nature, being particularly elongated; and they are not unfrequently united into one by a bond of union, extending between their inferior or sacral extremities across the aorta and vena cava, having a semilunar shape, a specimen of which I possess in my museum. They sometimes present a lobulated appearance, like that of the cow. Two pelves and two ureters sometimes exist. The kidneys are subject to hypertrophy and to atrophy, in the latter of which cases they sometimes diminish greatly in volume, but what remains is solid, while at other times they preserve their size, but are converted into a very thin sac.

The capsula renalis,* marked *y* in Plate XV. of Part X., situated on the upper or atlantal extremity of the kidney Y, to which it adheres by cellular substance, is a triangular body, flattened anteriorly or sternad, and posteriorly or dorsad, having its apex pointing upwards or atlantad. The capsula renalis of the left side is less, and rises higher or atlantad than that of the right side. Its anterior or sternal surface is invested with the peritoneum, and presents some furrows where the blood-vessels enter and emerge from its substance. It is surrounded or enveloped with a very thin serous membrane, which intimately adheres to its surface. This organ is of a tolerably firm lobulated texture, like the parotid gland, of a yellowish brown externally, and of a reddish brown internally. The external yellowish brown texture is firmer, and consists of fibres arranged perpendicularly from without inwards; while the internal reddish brown texture is softer, and forms the parietes of a small triangular cavity, which is supposed by some not to exist until after death, and that then it is the result of a spontaneous decomposition of the internal texture; but I may remark, that it is more easily discovered in the fresh than in the putrid state. The renal capsule is an imperfect gland, having no excretory duct.

The blood-vessels of the renal capsule have been described in page 23 of Part II.†

The pelvis of the kidney, marked P in *Figs.* 2 and 3 of Plate XIX. of Part X., I have already stated, diminishes in its calibre as it emerges from the concave fissure

They are subject to nephritis, abscess, scirrhus, cancer, tubercles, hydatids, and to calcareous depositions.

* Syn. Ren succenturiatus: Capsula seu glandula supra-renalis seu atrabiliaris.

† There is sometimes an increase of the renal capsule, so as to make it resemble more than one. It is besides subject to hypertrophy.

of the kidney to form the ureter W. The ureter, marked W in *Figs.* 2 and 3 of Plates XIX. XV. and XIV. of Part X., in Plates I. II. V. and VI. of Part XI., and in Plate XIV. of Part III., and Plate V. of Part II., in the last of which it is inadvertently marked f, descends behind or dorsad to the peritoneum, obliquely across the psoæ muscles M, K, dorsad to the spermatic plexus *g*, and sternad to the common iliac artery P, and then enters the pelvic cavity, running parallel with the internal iliac artery V, towards the body of the urinary bladder m, along which it extends near to its cervix, where it runs between its muscular and mucous tunics, and terminates by an orifice smaller in diameter than itself. In its course in the pelvis of the female it runs by the side of the uterus k,* and in that of the male it passes outwards or laterad to the vas deferens v.† The precise termination of the ureter in the male is displayed in Plate XIV. of Part III., and Plates I. and II. of Part XI., and in the female, in Plates V. and VI., whale-bone probes, marked s, being inserted in the termination of the ureters in Plates II. and VI.

The ureter is formed of three tunics, a cellular which is very loose, a muscular which appears condensed, fibrous, cellular substance, and a mucous that is thin and loose, and continuous with that investing the papillæ of the kidney, and with that of the urinary bladder.‡

* In extirpation of the uterus, the operator must keep in view the course of the ureter.

† In the lateral operation of lithotomy, the operator must remember the termination of the ureter in the bladder; his incision should extend between this and the vesicula seminalis.

‡ The ureter is sometimes deficient, occasionally terminates in the abdominal parietes between the umbilicus and symphysis pubis, frequently double on one side. It is subject to constriction, stricture, dilatation, and to calculus.

VISCERA OF THE PELVIS,

TOGETHER WITH

THE ORGANS OF GENERATION IN THE MALE AND FEMALE.

In the description of the viscera of the pelvis, I shall pursue the same connected arrangement as I have adopted with regard to those of the abdomen, and not in the order which the student should follow.* In the male pelvis there

* The student, when investigating the pelvic viscera and organs of generation of the male, should first examine the inflections of the peritoneum, particularly as they relate to puncturing the bladder above the pubes or from the rectum, and to the high operation or the recto-vesical or lateral operation of lithotomy; next the structure of the scrotum and testes, tracing the course of the vasa deferentia to the sides of the urinary bladder; thirdly, the external nerves, blood-vessels, and muscles of the perineum, and particularly as they relate to lithotomy; fourthly, the component parts of the penis from the glans onwards to the urinary bladder, deliberately studying the relation of these and the contiguous parts to lithotomy, to stricture of the urethra and fistula in perineo; fifthly, the relation of the rectum to the prostate gland, urinary bladder, and *cul-de-sac* of the peritoneum, as regards the recto-vesical operation and the lateral operation of lithotomy, and also for puncturing the bladder; sixthly, let him trace the blood-vessels distributed to these organs within the pelvis, from the inferior mesenteric and from the internal iliac arteries; seventhly, let him detach the one-half of the pelvis, together with one of the extremities, as in Plate XIV. of Part III. (the left side is the preferable to remove), paying great attention at the time to the strength and course of the levator ani muscle while dividing it; he ought now to trace the vasa deferentia around the

are situated the urinary bladder and rectum, with the ureters, the vasa deferentia, the vesiculæ seminales, and the prostate gland, with various nerves, blood-vessels, lymphatics, and muscles. In the female pelvis there are the urinary bladder, the ureters, the rectum, the uterus with its appendages, the vagina, and several nerves, blood-vessels, lymphatics, and muscles.

The urinary bladder, marked m in Plates I. V. and VI. of Part II., in Plate XIV. of Part III., in Plate XIV. of Part X., and in Plates I. II. V. and VI. of Part XI., is situated in the pelvic cavity, close to the ossa

bladder to the vesiculæ seminales, and onwards to the prostate gland, and examine deliberately the relation of these organs to lithotomy and the different operations specified; lastly, let him remove, in a mass, the urinary bladder, rectum, and penis, dividing the vasa deferentia near the inguinal canals. Having removed these important organs, he should again examine their connexion and relation to each other, and then proceed to investigate minutely their structures, beginning with the urinary bladder; next, the urethra; thirdly, the vasa deferentia, the vesiculæ seminales, and prostate gland; fourthly, the corpora cavernosa, &c. Before beginning the examination of these viscera, the student should insert again and again the catheter or sound in the urethra, and feel along the urethra from the glans penis to the anus, and also introduce the fingers of his left hand into the anus. When exploring these viscera and organs in the female, a similar order should be pursued:—First, the inflections of the peritoneum are to be traced as they relate to the supporting of the uterus and its appendages, to puncturing the urinary bladder above the pubes, and to extirpating the uterus or ovaria; secondly, the nature, relations, and course of the external parts and the anus, examining carefully the relation of the clitoris to the meatus urinarius, the situation of the circulus membranosus, the os uteri, and the perineum; thirdly, the external nerves, blood-vessels, and muscles of the perineum; fourthly, the arteries and veins and nerves distributed to the urinary bladder, uterus, and rectum; fifthly, let him remove in a mass, the bladder, uterus, and rectum, examining, during their removal, the course of the levator ani, and the course of the blood-vessels and ureters. When these organs have been removed, he should investigate their relations and connexions more deliberately, and afterwards manipulate their minute structure. He should particularly attend to the structure of the clitoris, to the extent of the urethra, to the connexion between the urinary bladder and the vagina, to the extent and structure of the perineum, to the structure of the uterus and its appendages, and to the connexion between all of them.

pubis, supported by the peritoneum a, and loose cellular substance, by its anterior ligaments, by the umbilical arteries, which are ligamentous cords in the adult, and are marked *n* in Plate VI. and *Fig.* 6 of Plate II. of Part II, and by the urachus, seen also in this last mentioned figure; it is of a pyramidal figure, being longer than it is broad, the base pointing atlantad, and the apex to the outlet of the pelvis; a slight difference, however, exists between the male and the female, the shape of the latter being rounder or more spherical, and a degree larger; the base is termed the fundus, the middle portion its body, the apex or inferior part its cervix, and the commencement of the urethra its mouth; it consists of one partial and three entire tunics, the former being the peritoneum, and the latter a cellular, a muscular, and a mucous. The peritoneum in the male, as illustrated in Plates XIV. of Parts III. and X., and in Plate I. of Part XI., marked a, is reflected from the rectum I, to what is termed the fundus of the bladder, to which adhering, it extends towards the symphysis pubis A, where it leaves the bladder and invests the recti, pyramidales, and transverse muscles of the abdomen. In Plate I. of Part XI., the precise extent of adhesion of the peritoneum *a* to the bladder is delineated, particularly as relates to puncturing the bladder from the rectum, or performing the recto-vesical operation of lithotomy. The triangular space, marked D, adheres intimately and closely to the rectum, the cellular substance here being short, and admitting of no motion or separation of these viscera. In the female, the peritoneum *a* covers the same extent of the urinary bladder m, as in the male, as depicted in Plate V. of Part XI.; but the uterus k, and vagina D, intervening between the urinary bladder m, and the rectum I, the peritoneum a is reflected from the bladder m, on to the pubic aspect of the uterus k.

The urinary bladder, in the female, adheres intimately to the vagina D, on which it rests. The anterior ligaments are merely the fascia which invests the interior or pelvic surface of the levator ani muscle, and which leaving the muscle, ascends on each side of the body of the bladder, to which it adheres. At the arch of the pubes, a number of foramina are observable, which give passage to the veins of the penis. The foramina are termed the labyrinth. The umbilical arteries, described in page 34 of Part II., become ligamentous cords soon after birth, and from their adhering to the urinary bladder in their course from the internal iliac artery to the umbilicus, assist in supporting this organ. The urachus is a ligamentous cord which extends from the pubic aspect of the fundus of the urinary bladder, and is apparently a continuation of its muscular fibres, upwards, or sternad, between the recti muscles and between the latter and the peritoneum, and is lost near the umbilicus, occasionally advancing to this region.

In Plates II. and V. of Part XI., the cellular tunic, marked P, is partially displayed, being situated immediately beneath the peritoneal *a*. In Plate V. the portion marked P, is at no time covered by the peritoneum *a*. The cellular tunic encircles completely the urinary bladder, and is very loose, and loaded with adipose substance.

The muscular tunic, which is represented in Plates I. II. and VI. of Part XI., and in Plate XIV. of Part II., marked m, also entirely invests the urinary bladder, but is thicker and bolder in some places than in others; more so on its pubic, atlantal, sacral, and coccygeal, than on its lateral aspects. The fibres run in such a manner as to make it a very complicated task to unravel them; they consist of an external and an internal arrangement, the former, or external, which are the thicker and stronger,

run chiefly longitudinally from the pubic to the sacral, and from the sacral to the pubic aspects, mingling with each other on the fundus; the posterior arrangements also extend downwards to the neck, and afterwards ascend to meet and mingle with those on the pubic aspect. From this disposition of the longitudinal fibres, the sides of the bladder are almost entirely divested of them. The internal arrangement of muscular fibres are chiefly oblique, and run opposed to one another in such a manner, as to frequently enterlace with each other, and thus to thicken the muscular tunic. Around the neck of the bladder, they run nearly transversely and very close to each other, in order to form what is termed the sphincter of the bladder.* Some bundles of these fibres also encircle the termination of each ureter, and accompany them onwards to the mucous coat. Beneath or centrad to this internal arrangement of fibres, there are perceptible in several places, particularly on its rectal aspect, thin muscular fibres running longitudinally, or from cervix to fundus. When the bladder is fully distended, we can perceive the mucous coat between the fibres of the muscular, particularly on the sides of the viscus.†

The mucous tunic, marked Q in Plates II. and VI. of Part X., is situated within or centrad to the muscular, and is the last of its coats, being in contact with the urine in the living state. In Plates II. and VI. of Part XI. this coat is depicted, the urinary bladder being laid open. It is loose, and is furnished with delicate villi and mucous

* Syn. Musculus sphincter vesicæ urinariæ.

† The muscular tunic should be thoroughly understood by the general practitioner and the operator, to enable them to comprehend its powers with regard to retention of urine, and grasping calculi during the operation of lithotomy, also with regard to sacculating or encysting calculi, and to contraction and thickening from either calculi, diseased prostate gland, stricture of the urethra, or fistulæ in perineo.

glands, having a number of folds, apparently caused by the internal arrangement of muscular fibres, the latter of which are most numerous in the region of the neck of the bladder.*

Within the bladder there are three apertures, two of them, marked w* w*, being the entrance of the ureters, and the third, U, the mouth of the bladder, or beginning of the urethra.† In Plates II. and VI. of Part II., where the urinary bladder is represented laid open, and whale-bone probes, s, are inserted in the ureters w, w, the entrances or apertures of these ducts are delineated; and a small papillary eminence, w*, is observable, which, as already remarked, is partly formed by the internal muscular fibres of the bladder accompanying the ureter, and also partly by the union of the mucous tunic of the ureter with that of the urinary bladder. The space between the ureters w*, w*, and the commencement, U, of the urethra, is named trigonus Lieutaudi;‡ and by some authors a projection is described at the apex of this triangle, named the uvula vesicæ, or la luette.

From the termination of the ureters, onwards to the commencement of the urethra, two fleshy bundles extend, which are named the corpora carnea Morgagni.

The nerves and blood-vessels to the urinary bladder have been described in Part II.

I shall now describe the urethra of the male, and then the remaining organs of generation peculiar to this sex; and afterwards those of the female, as the organs of the one differ so materially from those of the other.

* The structure of the mucous tunic should be investigated to comprehend its diseases, as inflammation, suppuration, ulceration, catarrh, ischuria, hæmaturia, calculus, loose and encysted tubercles, scirrhus and cancer.

† Vesical orifice: Orificium vesicale.

‡ Syn. Trigone vésical.

In Plate II. of Part XI., the urethra, marked U, is delineated extending from the urinary bladder to the glans penis K, an extent of eight or nine inches in the adult. This is a cylindrical mucous tube, a continuation of the mucous tunic Q of the bladder, but much thinner in texture, very sensitive, highly vascular, and contractile; presenting a number of longitudinal folds in its collapsed state, and being of a reddish colour. Throughout its whole extent there are observable a number of mucous lacunæ, or small culs-de-sac, represented by small shaded spots, and which have thin apertures or mouths, pointing to the glans penis K. These are named the glands of Littre, or canaliculi Morgagni, and are said to be only found on the inferior aspect of the circumference of the urethra, which however is incorrect. They are more numerous near the glans than the bladder; and one of them, from its magnitude, is named lacuna magna. This mucous membranous tube, the urethra, is surrounded in its course in the penis by several objects which divide the canal into portions, and on which these objects confer appellations. Immediately as the urethra U commences, or even the neck of the bladder itself, it is surrounded by the prostate gland t, and this is named the prostatic portion of the urethra. The situation of this gland is also seen in Plate I. of this Part. As the urethra U advances, it is encompassed with dense strong spongy cellular substance E, together with the triangular ligament of the penis, marked M in Plate XIV. of Part X., and this is improperly termed the membranous portion.* Beyond the membranous portion E, Plate II., onwards to the glans penis K, the urethra is enveloped with the cor-

* This is unquestionably the toughest, and sometimes the hardest portion of the urethra, the ligamentous substance being frequently cartilaginous, so that the lithotomist should be prepared, on laying open the urethra at this part, to encounter strong tough hard substance, not delicate membrane, as the name would indicate.

pus spongiosum G; the bulbous portion of which is marked F, and the glans K, being merely enlargements of this spongy substance. The external aperture, or termination, or commencement of the urethra, marked H, is termed the meatus urinarius externus, or the orificium cutaneum, from the mucous membrane joining or becoming cutaneous.

Many authors have described most minutely the variations of the canal of the urethra in its different portions, but these seem much exaggerated, for in a healthy well formed penis, with the exception of the prostatic portion and the meatus externus, it is pretty equal in its diameter or calibre throughout. The calibre of this canal, like that of the pharynx and œsophagus, no doubt, differs in relative magnitude in individuals; but with the exception of the portions already mentioned, it will be found to be pretty equal throughout. It is described to be large where it is surrounded with the prostate gland; to be considerably contracted about an inch anterior to this, which is styled the isthmus urethræ, or membranous portion; to be dilated again where the corpus spongiosum begins to encircle it, or at the bulb; to be again contracted anterior to this, and to retain the same calibre onwards to the glans, where it becomes again dilated, and forms what is termed the fossa navicularis, the meatus urinarius itself being a little contracted. Other authors, as Amussat,* prove that there is no enlargement of the canal within the glans, that the diameter insensibly enlarges from the meatus externus to the bulb, where it contracts, and that it then slightly expands at the membranous portion, thus representing a cone, the base of which is towards the urinary bladder.

* Remarques sur l'Uretère de l'Homme et de la Femme, dans Archives Gén. de Médecine, tom. iv.

The urethra is very sensitive and elastic, both in its longitudinal and transverse direction.*

Where the prostate gland t, in Plates I. and II. of Part XI., surrounds the urethra U, there is a small projection seen in Plate II., marked T, which is named veru montanum,† and around this a number of smaller foramina, indicated by black dots, are perceivable. The latter foramina are the openings of the ducts of the prostate gland, and the veru montanum is the opening of the vasa deferentia.

The prostate gland t in Plates I. and II. of Part XI. is a conglobate gland of the size and shape of a chesnut, or of a triangle, being a little more than an inch in width, one in length, and half an inch in thickness, and weighing about five drachms, situated at the rectal aspect of the neck of the urinary bladder, and commencement of the urethra, both of which it nearly surrounds, but particularly the latter: it also gives lodgement to the vasa deferentia V. Its base is towards the urinary bladder, and its apex towards the membranous portion E of the urethra, with its body resting upon and adhering to the rectum. The prostate is a remarkably firm fleshy gland,‡ of a greyish red colour, surrounded with a strong fibrous membrane, having several excretory ducts, from eight to twelve in number, opening into the urethra by small follicular apertures

* The urethra is subject to acute specific inflammation, and increased vitiated mucous secretion, constituting gonorrhœa; to chronic inflammation with increased mucous secretion, constituting gleet; to spasmodic and permanent stricture; and to fistula. It is also occasionally malformed, the meatus opening at the inferior aspect of the urethra, sometimes in the perineum; the whole canal is at other times remarkably small in diameter, scarcely two lines in diameter throughout, a case of which I have at present under my care.

† Syn. Caput gallinaginis, vel gallinaceum: colliculus seminalis.

‡ The structure, particularly the consistence of the prostate gland, should be considered by the lithotomist, and if well understood he will never use a gorget.

around the veru montanum T, in Plate II., by piercing its mucous membrane.* Some authors describe a third lobe belonging to this gland, the two bulbous expansions on the sides of the neck of the bladder forming the other two lateral lobes; but this condition is only observable in the diseased state. This third or middle lobe, when present, is situated between the two lateral lobes, the urinary bladder and the veru montanum, projecting into the urethra or neck of the urinary bladder.†

The membranous portion of the urethra, marked E in Plates I. and II. of Part XI., is surrounded with strong, dense, spongy cellular substance, together with the triangular ligament of the penis,‡ the latter of which is marked M in Plate XIV. of Part X., and descends from the symphysis pubis A* to encircle and support this part of the canal.

The remainder of the urethra U is supported by the corpus spongiosum marked F, G, K, in Plates I. and II., the commencement of which is named the bulb F, and the termination the glans penis K. This spongy body, of considerable length, forming one of the three objects entering into the composition of the penis, being situated in the inferior fossa formed by the corpora cavernosa, is of a cellular structure, encased in condensed cellular substance, and swells out at its extremities; the cells when injected are found to be formed of a network of arteries and veins, the latter being the more numerous, and considerably dilated. The bulb F is merely an enlargement of this spongy cellular tissue, the calibre of the urinary

* The prostate gland is subject to inflammation and suppuration, to scrophulous enlargement, to many of the sarcomatous swellings, and to cancer; is concerned in puncturing the urinary bladder, and in the lateral and recto-vesical operation of lithotomy: calculi are sometimes sacculated in the prostate gland.

† This diseased projection into the urethra often becomes an obstacle to the introduction of the catheter.

‡ Syn. Interosseous ligament.

canal being in no degree increased; therefore the term bulb of the urethra is very liable to deceive us.* The glans K is of a round triangular shape, appearing cleft in two at its inferior aspect, having its apex terminating the member, where the meatus urinarius H is situated, and its base towards the body of the penis having an abrupt acute circular edge, which is termed the corona glandis. At the root of the glans, where the penis is less in diameter, or contracted, it is denominated the cervix. The glans is invested with a mucous membrane, which is continuous with that of the prepuce, marked L in Plate I. This membrane adheres intimately with the cellular web that invests the corpus spongiosum throughout.

The other two bodies which, with the corpus spongiosum urethræ G, constitute the penis, are the corpora cavernosa, marked X, X, in Plates I. and II. In the former of these plates the corpus cavernosum of the right side is seen extending from the crus ischii, to which it intimately adheres, onwards to the glans K; the precise origin is, strictly speaking, where the crus of the os ischii unites with that of the os pubis: the termination of the corpus cavernosum is more distinctly seen in Plate II. These corpora cavernosa advancing from the rami of the bones of the ischia, unite with each other at the bulb of the corpus spongiosum, forming by their junction a fossa situated on their inferior aspect for this latter object, and another on their superior aspect for the vena magna Galeni, and advance, forming the sides and upper part of the penis, onwards to the glans K; they are enveloped with a strong fibrous membrane, which dips between them, extending from the fossa that lodges the corpus spongiosum, to that on the upper aspect, which

* The precise situation of the bulb is in the perineum, between the root of the scrotum and the anus.

lodges the vena magna penis. This septum, named pectiniforme, is imperfect, in order to allow the blood-vessels to communicate with freedom, see Part III. page 103. These bodies are cellular, like the corpus spongiosum, as delineated in Plate II.; but the cells are rather larger, and consist almost entirely of dilated veins. The corpora cavernosa, together with the corpus spongiosum, are surrounded with the common integuments, which adhere by very loose cellular substance to these bodies,* there being no adipose substance. At the neck of the glans they become loose and pendulous, projecting forwards in order to form a covering for the glans, which is named the prepuce, and is marked L in Plate I. At the distal extremity of the prepuce a circular aperture is left, in order to allow the urine to be voided, and the glans to be denuded.† The surface towards the glans is mucous,‡ being formed by a reflected inversion of the cutis vera and epidermis, which extends along the cervix and body of the glans, to the meatus urinarius. The prepuce L is still further connected with the glans K by means of the frenum,§ marked N in Plate I., which is situated at the inferior aspect of the member, and consists of a perpendicular fold of the mucous membrane, which extends between the glans near the meatus urethræ to the prepuce, thus rendering this membrane tight in this region, but slack and pendulous

* The loose adhesion of these integuments should be investigated, to enable us to understand how the matter in chancres sometimes burrows between the skin and corpora cavernosa for a considerable extent.

† When the circular aperture of the prepuce is too small to permit the prepuce to be drawn behind the glans, a very common malformation, it is termed phymosis, and when with such a malformation, or from inflammation and thickening, the prepuce is pulled behind the glans and cannot be brought forwards, the affection is styled paraphymosis.

‡ This mucous structure of prepuce and glans should be considered with regard to spurious gonorrhœa.

§ Syn. Frenulum glandis.

above or on the upper aspect of the glans. On each side of the frenum N, and all around the neck of the glans K, and root of the prepuce L, are observable a number of small mucous glandular bodies, which are marked M in Plate I., and are termed glandulæ Tysonianæ.*

The integuments from the inguinal region, and the root of the penis, become loose and pendulous, of a brown colour, and at its anal aspect extending to the perineum, in order to form the scrotum marked Z in Plates XIV. and XV. of Part III., which is larger inferiorly, or at its most depending point, than at its origin, or upper aspect. This is a musculo-cutaneous pouch, containing the testes. The cutaneous part is very thin and delicate, although the epidermis is thick and solid, having a number of transverse circular rugæ, or wrinkles, running downwards from the root of the penis, to the central line which extends from the inferior aspect of the root of the penis, along the scrotum to the perineum, and even to the anus, which central or mesial line is a condensation of the integuments, and is named the raphe. A number of long stiff hairs grow from the scrotum, which are interspersed here and there, but which on the pubes are much more thickly set. A number of sebaceous glands are also distributed over the integuments of the scrotum.†

Centrad to or within the cutaneous pouch, an arrangement of circular muscular fibres are observable, named the dartos,‡ which are denied by some to possess muscularity. A multiplicity of small blood-vessels, particularly veins, are present, which give it a reddish appearance. Between the cutaneous and the muscular tunics a quantity

* These small glands become the seat of chancres.

† These glands become occasionally affected with primary syphilitic ulcer, and with that peculiar ulceration, named chimney-sweeper's cancer.

‡ Syn. Tunica carnea.

of delicate loose cellular substance without any adipose matter is found; and within the muscular layer, there is still more loose cellular tissue in immediate contact with the tunica vaginalis testis and root of the penis.* The cellular tissue which descends from the inguinal region and symphysis pubis, is thicker and stronger than that around the testis. This cellular tissue, together with the muscular fibres of the dartos, extends from opposite the raphe to the root of the penis, so as to divide the scrotum into two smaller pouches, which partition is named the mediastinum or septum scroti.

The testis,† marked b in Plate XV. of Part III., of an oblong roundish or oval figure, is contained in one of these smaller sacs of the scrotum z, being separated from the other testis by the mediastinum, and enveloped in its two tunics, the tunica vaginalis and the tunica albuginea, and also partially by the fibres of the cremaster muscle a, the latter of which, together with the spermatic cord, suspends this organ.

The cremaster muscle,‡ marked a in Plate XV. of Part III, and partly described in page 7 of the same Part, derives its origin from the internal oblique muscle, emerges at the external aperture of the inguinal canal, and descends on the spermatic cord, which it nearly encircles, downwards to the tunica vaginalis testis b, on which its fibres, becoming gradually more and more sepa-

* The cellular tissue here should be carefully considered with regard to the effusion of urine in fistula of the urethra, and calculi arrested here in their progress from the urinary bladder to the glans penis. The circumstance of the whole cellular tissue of the scrotum being easily inflated with air, or distended with fluids, is a strong argument in favour of the dartos not being muscular, and there being no muscular septum, yet we have only to consider the nature of a muscle, to reconcile this event to our minds.

† Syn. Didymus: Geminus. ‡ Syn. Tunica carnea seu erythroides.

rated, are lost, and thus answer the purpose of a tunic to the testis. Although the fibres of the cremaster nearly encircle the cord, they are much more distinct on its anterior aspect. The action of this muscle is to elevate the testis, particularly during coition.

Beneath or centrad to the fibres of the cremaster muscle, a loose cellular envelope surrounds the spermatic cord, which also binds or connects the vessels and duct composing this cord, and is named the immediate sheath of the spermatic cord. At its root we find this cellular envelope, forming a loose firm tunic for the testis, enclosing the body of the gland, its appendix or epididymis, and the root of the spermatic cord, and having an internal serous surface. It is named the tunica vaginalis testis,* is marked b in Plate XV. of Part III., and in Plate I. of Part XI., and adheres intimately to the posterior aspect of the testis and epididymis,† where it is reflected over the testis and epididymis, becoming very thin at this part, and hence, like the peritoneum, forms a perfect sac. It thus leaves a space for blood-vessels, ducts, &c. to enter and emerge from the testis. The exterior layer of the tunica vaginalis is strong and fibrous. That portion of this tunic which immediately invests the gland itself, has been named conjunctiva.‡ The tunica vaginalis communicates or mingles with the cellular envelope of the spermatic cord, and is not a production of the peritoneum, as is clearly and satisfactorily explained by Monro Primus, in the 5th vol. of the Medical Essays and Observations.

* Syn. Tunica vaginalis testis propria.

† This adhesion of the tunica vaginalis to the testis should be understood with regard to hydrocele, to enable us to comprehend the situation of the testis in this dropsical affection. The tunica vaginalis is also subject to ossification and to hæmatocele, resulting after the operation of tapping for hydrocele or castration.

‡ Syn. Tunica vaginalis reflexa; External lamina of the tunica albuginea.

Within the tunica vaginalis, or from its serous surface, a halitus or serous fluid is secreted.

The testis r, with its epididymis *r*, and root of the spermatic cord, is situated within the tunica vaginalis, marked b in Plate XV. of Part III., and Plate I. of Part XI. The testis r, of an oblong roundish, or oval figure, flattened in some degree, so as to have two sides and two edges, the posterior of the latter of which adheres to the tunica vaginalis, and gives entrance to the blood-vessels; also two extremities, an inferior and an upper, the latter of which gives rest to the epididymis, is invested with its proper tunic, named albuginea,* as represented in the section of the gland in Plate I. of Part XI. This immediately invests the glandular substance, is of a silvery colour, thick, and fibrous, being covered outwardly with the tunica vaginalis, and being pierced superiorly by the seminiferous ducts, and posteriorly by the spermatic vessels. Within the tunica albuginea, the gland of the testicle itself is contained, which consists of blood-vessels and seminiferous ducts arranged in lobules or fasciculi, separated from each other by very delicate cellular membranaceous septa,† extending longitudinally and divaricating from each other. These adhere in a concentrated bundle at the posterior edge of the testis, which is named corpus Highmorianum or nucleus‡ of the testicle, and from this they divaricate to the opposite edge, where they also adhere to the tunica albuginea. This subdivision of the testis into compartments, is attempted to be represented in the section of the gland in Plate I. of Part XI. The seminiferous ducts,§ separat-

* Syn. Tunica anonyma: Tunica fibrosa.

† Syn. Sepimenta: Septulæ.

‡ Syn. Firmamentum.

§ Syn. Vascula serpentina: Canaliculi seminales: Tubi vel tubuli seminiferi: Tubuli testis: Vasa recta: Vasa seminalia.

ed by these septa, are exceedingly small and convoluted (as represented in *Fig.* 2 of Plate II., where the letter v is placed on the concentration of them, there named vas deferens, and the letters Y on the membranous septa, the drawing being taken from a preparation wherein the vas deferens has been injected with mercury), running towards the corpus Highmorianum, and there uniting * and concentrating, and advancing to the superior extremity, where they still further reunite, become larger, and pierce the tunica albuginea to constitute the epididymis. From their commencement to their piercing the albuginea, they are estimated to be 5000 feet in length. In their course between the membranaceous septa, they do not inosculate. When we bisect a testis, we find it remarkably soft and delicate, of a brownish tinge, and on laying hold of any portion with the dissecting forceps, we elevate and elongate several of these delicate convoluted seminiferous ducts.

The epididymis,† marked *r* in Plate XVI. of Part III., and in Plate I. of Part XI., is that appendix to the testis situated on its upper and posterior extremity, resembling the capitol of a cucurbit. It is invested, in precisely the same manner, as the body of the testis, with the tunica vaginalis and albuginea, the latter of which is much thinner where it is interposed between it and the body of the testis. The lower margin of the epididymis hangs freely over, and around the upper extremity of the testis. The most elevated point of the epididymis is termed the globus major, or head of this appendix.

Where the seminiferous ducts pierce the tunica albuginea, and form the epididymis, they are much larger, as may be understood by examining *Fig.* 2 of Plate II. of Part XI.; they are about twenty in number, connected to-

* Syn. Rete testis. † Syn. Testis accessorius: Tête du testicule.

gether by delicate cellular substance, and are termed vasa efferentia.* These concentrating form a flexuous tube, marked with the digit 1 in Plate XVI. of Part III., and with the letter v in Plate I. of Part XI., which descends along the posterior edge of the testis r, to its inferior extremity, where it assumes the name of vas deferens, and again ascends loosely connected to the testis, to its upper extremity, where it contributes to form a portion of the spermatic cord, along which it ascends posterior to the nervous and vascular plexus, to the inguinal canal, and enters the abdominal cavity.

Where the vasa efferentia of the epididymis have formed one duct, and are emerging from this appendix, the elongated conical portion is named its cauda.† The length of the ducts constituting the epididymis until it becomes the vas deferens, is calculated to measure about 30 feet.

A vas aberrans is described by some authors to pass off from the vas deferens, and terminate in a cul-de-sac; while another duct is described arising from the one end of the epididymis, and running into the other.

The vas deferens, marked v in Plate XIV. of Part III., in Plate XIV. of Part X., and Plate I. of Part XI., after its entrance into the abdominal cavity by the inguinal canal, proceeds dorsad of the peritoneum a, obliquely across the epigastric and the external iliac arteries, and the external iliac vein, and almost immediately separates at an acute angle from the nervous and vascular plexus *g**, forming the rest of the spermatic cord, in order to enter the pelvic cavity, where it descends still exterior to the peritoneum, by the side of the body of the urinary bladder m, to which it adheres, running between the bladder and the ureter w,

* Syn. Vasa excretoria; Vascular cones.

† Syn. Globus minor.

down towards the cervix vesicæ, where it communicates with the vesicula seminalis u, and meets the duct v, of the opposite side, to pierce the substance of the prostate gland t, and the urethra U. The two vasa deferentia unite immediately before their termination at an acute angle, but do not communicate; they form the papilla named the veru montanum, which is marked T in *Fig.* 1 of Plate II. of Part XI. The vas deferens adheres to the peritoneum, until it runs between the ureter and the urinary bladder, but is exterior to it throughout its course, and only very partially covered by this membrane. Near where the vas deferens runs between the ureter and urinary bladder, it becomes a trifle larger, and continues so almost to its termination, when it again contracts, but does not increase in thickness.

The vas deferens is a canal remarkably small in its calibre, its two tunics being exceedingly thick, particularly the exterior, which is very hard and solid, and of a brownish yellow colour. Lewenhoeck perceived longitudinal fibres running along it, and Meckel has seen circular fibres. Its interior or central tunic, of a whitish colour, is much thinner, united to the exterior by loose cellular substance, and is continuous with the mucous membrane of the urethra.*

The vesicula seminalis,† marked u in Plates XIV. of Parts III. and X., and in Plate I. of Part XI., is a convoluted tube of an oblong oval shape, situated on the sacro-lateral aspect of the neck of the urinary bladder, enveloped with tough cellular substance, and interspersed with a profusion of veins, and apparently a continuation of the vas deferens. The peritoneum does not invest it,

* The vas deferens is subject to malformation, terminating in a cul-de-sac, and also to stricture.

† Syn. Paraprostatæ.

and it consists of the same tunics as the vas deferens, with this difference, that the mucous has a number of short loose folds projecting inwards, forming a cellular structure resembling the interior of the gall bladder. The vesicula seminalis communicates freely with the vas deferens, so as to be considered a continuation of it.*

That portion of the vas deferens which extends from the vesicula to the urethra, is named by some authors, ductus ejaculatorius. It has the same structure as the vesicula seminalis. The veru montanum, marked T in *Fig.* 1 of Plate II. of Part XI., is a small soft eminence formed by the mucous membrane of the urethra, in which the two vasa deferentia enter the urethra. When we use a blowpipe to this eminence, we inflate a small lacuna or pouch, formed by a loose floating circular membrane, which surrounds these openings of the ducts. The lacuna is named sinus pocularis, or sinus Morgagni.

The description of the nervous and vascular distributions to the male organs of generation have been partly given in Parts II. and III.

In page 105 of Part III., the spermatic artery is traced to its entering the testis at its posterior margin, where the tunica vaginalis begins to be reflected over the gland. The spermatic artery here pierces with several branches the tunica albuginea, both where this membrane envelopes the testis, as also the epididymis. It generally consists of two fasciculi of branches, the one larger and somewhat anterior, which is distributed to the testis itself; the other smaller and rather posterior, distributed to the epididymis. The fasciculis to the testis divides into still more minute ramifications, which run in a serpentine manner, and

* The vesiculæ seminales are sometimes deficient. They sometimes adhere to the neighbouring parts from inflammation, and are occasionally scirrhous. Calculi have been found in their tubes.

accompany the multiplied convolutions of the seminiferous ducts.

Within the glandular structure of the testicle, a still greater number of veins originate, which accompany the arteries, and emerge piercing the tunica albuginea; they then ascend along the spermatic cord, anterior to the vas deferens, concentrating and running in a convoluted manner, frequently crossing the arteries upwards to the inguinal canal, by which they enter the abdominal cavity, and accompany the spermatic artery, as described in page 25 of Part II. These spermatic veins, in their course along the cord, have numerous valves.* Where the spermatic veins emerge from the gland of the testis, they resemble the tendrils of a vine, and are named corpus pampiniforme, or corpus pyramidale, from their pyramidal appearance. The vascular plexus formed by the veins and arteries in their course along the cord, has also been termed vasa pampiniformia.

The formation of the spermatic plexus of nerves has been described in page 30 of Part II., and delineated in Plate 5 of the same Part, in which it is seen to accompany the artery *g*, to the ovarium. In the male it also accompanies the spermatic artery, with which it emerges at the inguinal canal, and descends along the spermatic cord, as represented in Plate XVI. of Part III., to the testicle, which it enters by the most minute filaments, together with the artery. In this course the spermatic plexus unites with the spermatic twig of the first lumbar nerve, marked with the digit 1, in Plate XV. of Part III., and also with filaments of the internal pudic nerve.

* The spermatic veins, as also those of the scrotum, particularly the former, are very subject to become varicose, constituting the disease named varicocele, or circocele. The spermatic cord is subject to dropsy, to scrophulous enlargement, to scirrhus, and to hæmatocele.

In the fetus in utero, prior to the sixth month of utero-gestation, the testis is situated partly in the renal and partly in the iliac region, dorsad to the peritoneum, immediately sacrad to the kidney, resting on the psoas magnus muscle, which satisfactorily accounts for the origin of the spermatic plexus of nerves, and the spermatic artery, and also the termination of the spermatic vein. Between the seventh and eighth months of utero-gestation, the testis begins to descend, behind or dorsad to the peritoneum, to the inguinal canal, where it emerges from the abdominal cavity, and descends into the scrotum, but without dragging down the peritoneum in its progress to form the tunica vaginalis, but only cellular substance, of which this tunic is formed, as has been already explained. In thus deviating from the description of modern authors, I am following Nature, and the clear simple account given by Monro Primus, in the 5th vol. of the Edinburgh Medical Essays and Observations. In the early period of the fetus, while the testis is in the abdomen, a ligamentous looking cord, of a triangular shape, named gubernaculum,* is reflected from the inguinal canal into the abdominal cavity, and attached by its base to the body of the testis. As the testis advances to the inguinal canal, this ligamentous cord becomes blended with the fibres of the cremaster muscle. †

* Syn. Vagina: Cylindrus: Basis.

† The testes are irregular in their descent from the abdominal cavity; sometimes they begin so early as the fifth month, sometimes the one descends before the other, while at others not until after birth, and occasionally never, one or both remaining in the abdomen for life. In some rare instances three testes have been found, two on the one side, and one on the other; an example of which I witnessed lately in a gentleman who consulted me about it, and who mistook it for hernia. The testicle is subject to many diseases, as, for example, inflammation constituting hernia humoralis, suppuration, fistulous or sinuous ulcers, scirrhus, cancer, scrophulous enlargement, cartilaginous enlargement, sarcomatous enlarge-

Two or three small glands, named after Cowper, are sometimes, but not always, found between the bulb of the urethra O, and the prostate gland t, as delineated in Plate XIV. of Part X., and one of which is marked N. When three are present, one is found on the one side of the urethra, and two on the other, and the anterior of the two latter is named the antiprostate gland. They are small conglomerate glands, of a round or oblong shape, and of a yellowish colour, enveloped in a strong cellular fascia, with long distinct ducts, which piercing the corpus spongiosum, enter the mucous membrane of the urethra.

I shall now proceed to the description of the muscles of the perineum in the malé, which are delineated in Plate XIV. of Part III.

The accelerator urinæ* muscle, marked o in Plate XIV. of Part III., is situated beneath the integuments and a strong fascia, covering the proximal or perineal half of the corpus spongiosum urethræ. It derives a very delicate fleshy origin from the ramus of the os pubis, glides obliquely over the corpus cavernosum X, and the insertion of the erector penis p, from both of which objects it also either originates, or is attached for two or three inches downwards opposite the bulb of the urethra. The delicate fibres descend obliquely across the corpus spongiosum, and unite with those of the opposite muscle on the centre of this body, forming a delicate white tendinous line; the

ment, hydro-sarcocele, fungous excrescences, one of which is named lipoma, and to ossification. One or both are occasionally entirely wasted away. I had lately under my care a young gentleman affected with hernia humoralis, and one of whose testes is now scarcely the size of a horse bean.

* Syn. Primus penis musculus: Inferior sive urethram trahens: Musculus urethræ seu accelerator: Dilatator urethræ, sive accelerator seminis et urinæ: Urethram dilatans: Accelerator: Le bulbo-caverneux: Accelerator urinæ seu ejaculator seminis: Bulbo-urethral: Bulbo-syndesmo-caverneux.

muscles adhering in their course to the exterior cellular envelope of the corpus spongiosum, from their union superiorly down to the membranous portion. The inferior fibres unite also with those of the levator ani s, the transversus perinæi q, and the sphincter ani r muscles. The function of this muscle is to propel the urine or semen in their course along the urethra.*

The transversus perinæi† muscle, marked q in Plate XIV. of Part III., and situated between the tuberosity of the os ischium and bulb of the urethra, is sometimes single and sometimes double, more generally single. When double, as was the case in this subject, the deeper muscle to be immediately described, is named transversus perinæi alter. This muscle, marked q, is remarkably delicate, and sometimes consists of more than one fasciculus of carneous fibres, which derive their origin from the strong fascia covering the tuberosity of the os ischium G, and proceed either directly or obliquely across to the bond of union of these perineal fibres, those of this muscle mingling with the fibres of the accelerator urinæ o, the levator ani s, and the sphincter ani r muscles. The function of the transversi perinæi muscles is to keep the urethra and rectum, or anus, in the mesial plane, and to compress the urethra during the evacuation of the urine and

* When dissecting the accelerator urinæ muscle, the student must proceed with great caution, as it is very thin, and liable to be removed. He should make an oblique incision in the perineum, parallel with the fibres of the muscle near its middle, and proceed cautiously deeper and deeper, by removing the loose cellular substance, until he arrives at the condensed cellular envelope, which being also carefully removed, the fleshy fibres will be displayed, and are to be exposed by dissecting upwards and downwards, parallel with their arrangement.

† Syn. Levator ani parvus, seu externus: Transversus seu transversalis: Transversalis penis: Le dilatateur, qui part de la parte interieure de la tuberosité sciatique: Penis seu urethræ musculus transversus: Le transverse du périné: Ischio-perinéal: Ischio-pubi-prostatique.

seminal fluid; hence assisting the preceding muscles in their action.* This transversus perinæi is frequently deficient. The transversus perinæi alter† is much more generally found than the preceding. I may state, that I have never found it deficient. It is situated immediately deeper or centrad of the former, and is a stronger fasciculus of fibres, of a triangular shape, the base of which is towards the ramus of the os ischii, and the apex towards the bulb of the urethra, deriving its origin from the ramus of the os ischii, and extending directly across, with short fleshy fibres, which are inserted in the accelerator urinæ muscle o, opposite the bulb of the urethra. In Plate XIV. of Part III. this muscle should fill up the dark triangular space formed by the transversus perinæi q, the accelerator urinæ o, and the erector penis p muscles. Its function is the same as that of the preceding muscle.

The erector penis ‡ muscle, marked p in Plate XIV. of Part III., and situated along the ramus of the os ischium and os pubis, is a strong muscle, deriving its origin from the mesial aspect of the ramus of the os ischii, close to its tuberosity, and ascending along the ramus and corpus cavernosum penis, on the tendinous fascia of the latter of which its fibres are lost. This muscle sometimes originates with fleshy fibres, and at other times with tendinous ones; and sometimes its middle fibres are tendinous, and at others carneous; so that it

* In order to display the transversus perinæi muscle, a transverse incision of the integuments ought to be made from the region of the bulb of the urethra to the tuberosity of the os ischium, and the cellular tissue, which is very thready or fibrous here, should be carefully removed by incisions made parallel with that through the skin, or the fibres of the muscle.

† Syn. Urethræ elevator seu ejaculator: Ischio-prostatique.

‡ Syn. Tertius et quartus penis musculus: Posterior penis musculus: Erector Collateralis, sive penem erigens: L'ischio-caverneux: Ischio-uréthral.

always presents a variegated appearance of alternate carneous and tendinous fibres. Its fibres nearly encircle the corpus cavernosum, and adhere to those of the accelerator urinæ muscle; and the terminating fibres on the corpus cavernosum run beneath those of the accelerator urinæ muscle. The function of this pair of muscles is to draw the corpora cavernosa backwards and downwards, or dorsad and sacrad, compressing them at the same time; and by the one muscle opposing the other in the lateral directions, they prevent these bodies from moving either dextrad or sinistrad. The action of these muscles is still more evident when the corpora cavernosa are distended, and these muscles may assist in their distension.*

The sphincter ani muscle, marked with the letters r in Plate XIV. of Part III., and situated around the anus I, is a delicate arrangement of scattered carneous fibres, which derive their origin from the apex of the os coccygis C, and run in an elliptical manner, on each side of the termination of the rectum I, or the anus, and are blended at the perineum with the fibres of the accelerator urinæ o, the transversus perinæi q, and the levator ani s, muscles. The fibres of this muscle are sometimes very pale and delicate, and interspersed with adipose substance, while at others they are strong, fleshy, and united to each other; occasionally they form a mass of considerable breadth surrounding the rectum, so much so, as to make some anatomists consider there are two sphincter muscles, an external and an internal.† The

* This muscle is readily discovered, and with facility displayed. The student should attend to the close connexion its fibres have with those of the accelerator urinæ, neither of whose fibres should be cut in the lateral operation of lithotomy.

† Synonyms of sphincter externus ani muscle. Musculus orbiculatim intestino obductus: Musculus orbicularis recti intestini, sphincter dictus: Sphincter pri-

function of the sphincter ani muscle is to keep the anus closed, until the desire to evacuate the feces overcomes it, when it then also assists in expelling them; and after their expulsion, it again acts as a janitor. This muscle likewise assists indirectly, through the medium of the levator ani, in propelling the urine along the urethra.*

The levator ani† muscle, marked s in Plate XIV. of Part III., and Plate I. of Part XI., is a circular or conical arrangement of strong carneous fibres, situated partly within and partly without the pelvic cavity, surrounding the neck of the bladder, and the termination of the rectum. It originates within the pelvis from the tendinous fascia, investing the obturatores interni muscles, the ligamentous fascia described in page 55, and from the central aspects of the symphysis pubis, and the os coccygis. From this circular origin, the fibres descend in a funnel-like shape, surrounding the neck of the bladder, the vesiculæ seminales, the prostate gland, the mem-

mus et externus, carnosus: Constrictor ani: Sphincter ani: Les sphincters cutanés: Pars per perinæum procurrens, videtur esse levator ani sextus gracilis et acuminatus: Est l'un des muscles dilatateurs de l'urethre: Urethræ dilatator posticus: Penis musculus triangularis: Urethræ virilis, dilatator posticus, sive triangularis: Coccygio-anal: Coccygio-cutané sphincter.

Synonyms of sphincter internus ani muscle. An est musculus cutaneus et circularis in extrema sedis ora collocatus: Sphincter cutaneus: Sphincter cutaneus ac superficialis: Sphincter internus: Le sphincter intestinal ou orbiculaire.

* The sphincter ani requires great care in its dissection, as its fibres are sometimes very pale and delicate. A slight semicircular incision should be made on each side, close to the verge of the anus, through the integuments, where they become the mucous membrane of the gut, and the fleshy fibres will appear, which are to be displayed by carefully dissecting in their course, and removing only the skin, for the fatty substance which generally lies between the fasciculi is liable to mislead the student. The sphincter ani muscle should be studied with regard to fistula in ano, and the recto-vesical operation of lithotomy.

† Syn. Musculus sedem attollens: Latus ani: Major levator ani: Levator: Levator magnus seu internus: Le releveur de l'anus: Sous-pubio-coccygien: Pubio-coccygien-annulaire.

branous portion of the urethra, and the termination of the rectum, to be inserted around the anus, the fibres running beneath those of the sphincter ani muscle r. The function of this muscle is to resist the peristaltic action of the intestines, particularly the rectum, until the desire to expel the feces calls it into action, when it then, in the first place, becomes quiescent; and, in the second, assists the rectum in their expulsion, by compressing it. This muscle also assists indirectly in expelling the urine, by pulling the sphincter ani upwards and forwards, or atlantad and sternad, which stretches the fibres of the acceleratores urinæ, and presses the bulb against the arch of the pubes, and shortens or contracts the membranous portion of the urethra. This muscle likewise aids indirectly the erectores penis, through the medium of the sphincter ani muscle, and assists in the expulsion of the seminal fluid, in the same manner as it does that of the urine, also by compressing the vesiculæ seminales.*

* The levator ani muscle is difficult to dissect, in consequence of its depth from the surface of the body. After the student has displayed the sphincter ani r, and the transversus perinæi q, muscles, he should remove with freedom a considerable portion of the adipose substance situated between the tuberosity of the os ischii and the rectum, proceeding cautiously near the latter, when he will perceive an arrangement of fleshy muscular fibres descending obliquely from within the pelvic cavity towards the anus. He must then dissect from the anus towards the pelvis, and dissect cleanly all the fibres of this muscle, which in fat subjects are generally interspersed with adipose substance. This is a muscle of great importance to the Lithotomist when performing the lateral operation, for until its fibres are freely divided, he cannot arrive at the membranous and prostatic portions of the urethra, or cut freely the neck of the urinary bladder. Still less can he extract a calculus of common magnitude, without tearing and lacerating its fibres. It is from bruising and lacerating and protracting this operation, that so many die of it. Free incisions do no harm; while small incisions lead to contusion, and laceration, and inflammation, with fatal results. Were operators daily occupied in dissection, few or none would die of this operation; but alas! how many surgeons belong to hospitals, who have never handled a scalpel on the dead body, either before or after their appointment. The great quantity of cellular and

ORGANS OF GENERATION

IN

THE FEMALE.

THE organs of generation in the female are partly situated within the pelvis, and partly at the outlet of that cavity, and hence are divided, for the sake of simplicity and perspicuity, into the external parts or organs, and into the internal organs of generation; thus we observe a difference between those of the male and those of the female, the former being situated more without than within the pelvic cavity. These organs are delineated in Plates III. IV. V. and VI. of Part XI., and also in Plates I. V. and VI. of Part II.

The external organs, or those of copulation (organa copulationis), are the vagina, with its appendages, which are the mons veneris, the labia externa, the clitoris with its prepuce, the nymphæ, the meatus urinarius, and the hymen.

The hymen is considered the membrane which divides the external from the internal organs. Authors in their description of the external parts differ greatly in what are the limits of the vagina, some making the whole canal from the external aperture to the os uteri the vagina, which, in my opinion, is the simplest and most correct; while others define it to be that portion of the tube from the meatus urinarius to the os uteri; while others, again, only that part from the hymen to the os uteri.

adipose substances, in this triangular space, should be kept in view by the lithotomist, and by the practitioner, with regard to abscesses in this quarter, to fistula in ano, and in perinæo.

There can be no difference of opinion with respect to the function of these parts, although some authors consider that portion which is external to the hymen as only performing the function of copulation, while that internal to this membrane is regarded only as performing that of generation.

The mons veneris is that cushion of cellular and adipose substances, covered with the integuments, thickly studded with long thick hairs, situated on the symphysis and bodies of the bones of the pubes, and delineated in Plates III. and V. of Part XI., marked A. It is supported by a strong cellular prolongation or fascia, marked 70 in Plate IV. of Part XI., which is partly continuous with the fascia superficialis, and partly originating from the external oblique muscles, and may be named the ligamentum suspensorium, being analogous to that of the penis in the male.

The labia externa,* marked B in Plates III. IV. and V., are those large tumid oblong bodies which descend from the mons veneris A, on each side of the vagina D, downwards to the perineum E, thus meeting both superiorly and inferiorly, forming the entrance of the vagina,† and forming two acute angles, the upper of which is named the superior commissure,‡ marked c, and the lower the inferior commissure,§ marked d*, the latter of which has a delicate transverse fold within the vagina, which unites the two labia externa, and is named frenulum pudendi;‖ and the space between this frenulum and the inferior commissure, which is exceedingly small, is termed fossa navicularis.

* Syn. Labia pudendi magna: Alæ pudendi majores.

† Syn. Vestibule: Vulva: Fossa magna. The vestibulum is defined by some authors to be formed by the nymphæ and perineum.

‡ Syn. Commissura anterior.

§ Syn. Commissura posterior.

‖ Syn. Furcula: Fourchette.

Some authors describe this fossa to be formed between the frenulum and the circulus membranosus L; indeed both the frenulum and this fossa are so indistinct, that they exist more in the mind of the anatomist than in nature. Each external labium B consists of the common integuments, which on their dermal or peripheral aspect are cutaneous, while on their mesial aspect they are mucous, the one structure running into the other. Within their cutaneous envelope a considerable quantity of cellular and adipose substances is found, and on the mucous surface a number of mucous follicles are observable.* The same aponeurotic web, marked 70 in Plate IV. of Part XI., which descends from the fascia superficialis and external oblique muscle to support the mons veneris, continues to run into the cellular tissue forming these bodies, in order to support them, and may be termed also ligamentum suspensorium labiorum externorum.

The space between the inferior commissure d* and the anus I** is named the perineum,† and is marked x in Plate III. of Part XI. This consists of the integuments, of the union of the sphincter vaginæ, N, and sphincter ani, r, muscles, together with cellular and adipose substances, as delineated in Plates III. and IV. of Part XI.‡ On

* The mucous surface of the labia externa is the seat of syphilitic ulcers and warty excrescences. The labia, when inflamed, sometimes shut up the vagina, and prevent the evacuation of the urine; and when attacked with phagedenic ulceration or hospital gangrene, they sphacelate with prodigious rapidity. They occasionally acquire a considerable magnitude from protracted leucorrhœa, or chronic inflammatory determination to them. In inguinal hernia, the viscera are liable to descend into the external labium. The labia externa are sometimes deficient, and are sometimes united together, forming an imperforated vagina; while occasionally the one is larger than the other.

† Syn. Perinæum anterius.

‡ The perineum is an object of much interest to the accoucheur, from its being very liable to be lacerated during parturition, unless supported during the efforts of nature at this period.

the surface of the integuments, a projecting line extends from the vagina to the anus, named the raphe, which is also indicated by the letter E in Plate III. of Part XI.

Immediately within or sacrad to the superior commissure C, the præputium clitoridis H is situated, which is a loose triangular elongation of the skin, that descends around and on each side of the glans clitoridis G, downwards to the nymphæ F, F, in a similar manner to the prepuce of the penis in the male. The prepuce is thin, soft, and moist on both its surfaces, particularly the internal, which is mucous; and a number of sebaceous glands * are situated in the angular fold formed between it and the glans clitoridis.

The glans clitoridis,† marked G in Plates III. IV. V. and VI. of Part XI., is the termination of the union of the two bodies, named crura clitoridis, one of which is delineated in Plates V. and VI., marked g. The situation of the clitoris, therefore, is immediately beneath, or sacrad, or coccygead, to the superior commissure C, or the arch of the pubes, and is surrounded with its prepuce H. It is an oblong round body, formed by these two crura g, each of which is attached to the point of union of the crura ischii et pubis, from which they ascend towards the arch of the pubes, where they unite at an obtuse angle to form this oblong body, that protrudes peripherad, covered by its præputium H, and terminates at the glans G. The crura and body of the clitoris have a production of the fascia, common to the mons veneris and labia externa, expanded over them, which is named ligamentum suspensorium clitoridis.

* Syn. Glandulæ odoriferæ.

† Synonyms of the clitoris: Membrum muliebre: Coles feminarum: Nympha: Mentula muliebris.

The crura clitoridis* G consist of a spongy structure, enveloped with a strong fibrous sheath, as delineated in Plates V. and VI., particularly in *Fig.* 2 of the latter. From the point where the two crura unite to form the body of the clitoris onwards to the glans, they, or it, is encircled with the same fibrous envelope, which also sends a cribriform partition perpendicularly across to divide the clitoris, precisely in the same manner as that of the corpora cavernosa penis. Where the body of the clitoris becomes as it were the glans, the latter can be separated from the former, being only held together by cellular substance, nerves, and blood-vessels; and the end of the body of the clitoris has a concave surface, which receives the glans. The glans consists of the same spongy texture as the crura, which in all of them is found to be formed by large veins, frequently anastomosing. The glans has no septum, and is invested with a thin mucous membrane, covered with a thick soft epidermis.†

The nymphæ, or labia interna,‡ marked F in Plates III. V. and VI., descend on each side of the vagina D, from the clitoris G to the inferior commissure, where they are blended together. They are thin loose prolongations of the mucous membrane of the vagina, of an oblong shape,

* Syn. Corpora cavernosa clitoridis; Corpora spongiosa clitoridis.

† The situation of the clitoris should be well understood by the practitioner, as it is the guide to the meatus urinarius or opening of the urethra, when drawing off the urine with the catheter in the living body. It is liable to become the subject of operation, from being morbidly enlarged or scirrhous; is subject to malformation, being then also so enlarged as occasionally to deceive the parents with regard to the sex of the child. It is this which constitutes hermaphrodism; and in this case the prepuce and glans are well formed, and there is a fissure at the extremity of the glans. The malformation is easily ascertained by attentive examination.

‡ Syn. Labia pudendi minores; Alæ minores.

and reddish colour, somewhat similar to the wattles of the domestic cock. They consist of a very delicate spongy texture,* which is continuous with that of the glans clitoridis, but much finer, and enveloped with the mucous membrane of the vagina, the central surface being continuous with this, and the peripheral with that investing the external labium.† A number of sebaceous or mucous lacunæ are found on the nymphæ. In some, the nymphæ do not descend beyond the middle of the side of the vagina.

Centrad, or deeper in the vagina than the nymphæ F, F, and about an inch from the glans clitoridis G, under the arch of the pubes, the meatus urinarius K is situated.‡ The loose projection at its inferior or perineal aspect consists of a vascular spongy texture, and is named by some corpus glandulosum;§ and around the circumference of this orifice a number of mucous follicles are situated.|| The meatus urinarius K, is the outer aperture of the urethra, marked T in Plate V., and U in Plate VI. of Part XI., which is observed to be much shorter and wider in the female than in the male, being only about two inches in length, and a little more than a quarter of an inch in diameter. It extends from the meatus urinarius K, under the arch of the pubes A*, to the urinary bladder m; and consists, like that of the male, of a mu-

* Syn. Corpus cavernosum nymphæ.

† The nymphæ are found of very great magnitude in the race of the Boschismans, protruding beyond the external labia; and are also occasionally morbidly increased in size in Europeans. Sometimes they are deficient, and at others are found adhering, either from malformation or inflammation.

‡ The student should make himself master of the situation and structure of the meatus, together with the course of the urethra, in order to be able to remove the urine with the catheter in the living body, when requisite.

§ Syn. Glandulæ prostatæ mulierum.

|| Syn. Prostata Bartholiniana.

cous tunic, marked U in Plate VI., with a spongy muscular tissue around.

Still deeper in the vagina than the meatus urinarius K, the circulus membranosus, or hymen,* marked L in Plate III. of Part XI., is situated, which is a circular or oval duplicature of the mucous membrane of the vagina, with an aperture in its centre; it is formed by an extension of that continuous with the mucous membrane of the nymphæ, and that continuous with the mucous membrane deeper than the hymen, united by cellular substance. This membranous circle is seldom complete, and its aperture is rarely in the middle, and always irregular. The broadest part of this membrane is generally towards the perineum. In the adult, particularly in the married female, instead of this membranous circle, there are merely short prolongations on each side of the vagina, as represented in Plates V. and VI. of Part XI., also marked L, and then named carunculæ myrtiformes. The circulus membranosus may be said to separate the external from the internal organs of generation,† and is considered by some authors to form the orificium vaginæ, the space between the external labia and the circulus membranosus being termed the vestibulum.‡ Between the meatus urinarius and the circulus membranosus, a number of mucous lacunæ are found extending around this portion of the canal.

The internal organs of generation or formation (organa generationis seu formantia,) are considered to be the re-

* Syn. Valvula vaginæ.

† The circulus membranosus is not unfrequently imperforated, in which case it is generally thicker and firmer, so that when the catamenia are secreted, they accumulate behind it, and excite violent pain, so as to require this membrane to be crucially divided. It must be prevented reuniting by sponge tent.

‡ The whole extent of mucous surface, from the external labia to the circulus membranosus, is the seat of primary syphilitic ulcers and warty excrescences.

mainder of the vagina, with the uterus and its appendages; but this is more arbitrary than if the whole of the vagina is included under the external organs of copulation, and the uterus, with its appendages, made the organs of generation.

The continuation of the vagina D, is a circular or oval mucous tube, about four inches in length and one in diameter, situated between the urinary bladder m, and the rectum I, and running in the direction of the axis of the pelvis, beginning at the circulus membranosus L, and terminating in a cul-de-sac,* around the os uteri R, as delineated in Plates III. V. and VI. of Part XI. Its commencement at the circulus membranosus, which is the narrower of the two extremities, is named the orifice of the vagina.† The canal is more capacious at its upper or vesical region than at its lower or rectal region, and is longer in the latter or rectal than in the vesical direction. The vagina consists of two structures, an external, marked V in Plates V. and VI. of Part XI., which appears partly muscular and partly vascular; and an internal, marked D in the same plates, which is mucous, being only covered for a very small extent at its lower or sacral aspect, where it separates the uterus from the rectum by the peritoneum, as seen in *Fig.* 1 of Plate VI., the peritoneal membrane being marked *a*.‡ The external and internal layers or tunics are connected together with tolerable closeness; the external V is thick, solid, of a reddish colour, and appears continuous with the fibrous texture *b* of

* Syn. Fundus vaginæ.

† Syn. Aditus vaginæ: Os externum uteri. The orifice of the vagina is described by some to be that portion of the canal between the meatus urinarius and the circulus membranosus.

‡ Hernia sometimes takes place here between the uterus and the rectum, and the water in ascites makes a pouch occasionally, so as to enable it to be drawn off here.

the uterus. This external layer V adheres intimately to the urinary bladder m, on its upper or pubic aspect, and also to the rectum I, on its sacral or coccygeal aspect, there being very little cellular tissue forming this bond of adhesion; and hence we may discard a cellular tunic as belonging to the vagina, described by some authors.* The internal or mucous tunic D, of a reddish colour in the living, but bluish white in the dead state, has a number of semicircular rugæ,† as delineated in Plates V. and VI., which run transversely across the direction of the canal, meeting with one another on each side at a longitudinal white line,‡ as represented in *Fig.* 1 of Plate VI. These transverse rugæ, most conspicuous in the virgin, and some of which are oblique, appear continuous with those in the cervix uteri, marked *e* in *Fig.* 1 of Plate VI.; and are largest and most numerous near the circulus membranosus, as delineated in Plate V. The mucous membrane of the vagina is continuous with that of the uterus. Throughout this mucous membrane, but particularly on its upper aspect, a number of mucous glands are situated, and between this mucous membrane D, and the external tissue V, a multiplicity of blood-vessels, especially veins, are found, some of which form a vascular plexus,§ near the circulus membranosus, as represented in *Fig.* 2 of Plate VI., marked *f*. The nervous and vascular distributions to these external organs have been described in Part II.‖

* The intimate adhesion of the vagina to the urinary bladder should be investigated when an incision for calculus in the bladder is required.

† Syn. Columna rugarum anterior et posterior.

‡ Syn. Raphe.

§ Syn. Plexus retiformis: Corpus cavernosum vaginæ.

‖ The vagina is sometimes so inflamed as to terminate in adhesion, and produce more or less contraction or stricture. It is occasionally involved in scirrhus uteri, and also in cancerous ulceration extending from that of the uterus, in which

The muscles which operate on these external organs of generation of the female, are the sphincteres vaginæ, the erectores clitoridis, the transversi perinæi, the levator ani, and sphincter ani; all of which are developed in Plate IV. of Part XI.

The sphincter vaginæ,* marked N in Plate IV. of Part XI., and situated exterior to the mucous membrane investing the external labium and contiguous portion of the vagina, is a broad fleshy muscle, which derives a scattered origin from the union of fibres belonging to the sphincter ani r, the transversus perinæi q, and the levator ani s muscles, and ascends on the side of the mucous membrane of the vagina, and is lost near the superior commissure c, on the ligament which supports the crura clitoridis, the fibres running under the ligamentum suspensorium labii externi 70, and over those of the erector clitoridis P. The function of this muscle is indicated by its name.

The erector clitoridis,† marked P in Plate IV. of Part

case it sometimes forms a communication either with the urinary bladder or the rectum. The vagina is also liable to be inverted or everted in prolapsus uteri. In a few instances, polypi have been found growing from the vagina, in the contiguity of the os uteri. The canal is occasionally malformed, being either very narrow in its transverse diameter, or very short in its length; sometimes it is imperforated, while at others it is deficient, there being nothing but loose cellular substance in its place, and on some rare occasions a double vagina has been found, there being a longitudinal septum extending from without to the os uteri, and even two hymens present.

* Syn. Orbicularis musculus sinum muliebrem undequaque obvolvens: Clitoridis inferior latus et planus: Portio carnosa in externa parte vaginæ: Alius musculorum paris, quod clitoridi a plerisque adscribitur: Vaginæ musculi constrictorii: Eadem sphincteris vaginæ: Constrictor cunni: The second muscle belonging to the clitoris: L'autre muscle du clitoris: Périnéo-clitorien: Anulo-syndesmo-clitorien.

† Syn. Clitoridis musculus: Clitoridis musculus tensioni dicatus: Superior rotundus: Musculus qui ab osse coxendicis oritur: The first muscle belonging to the clitoris: Ischio-caverneux: Ischio-sous-clitorien: Ischio-clitoridien.

XI., situated on the rami of the ossa ischii et pubis, derives its origin from the ramus of the os ischii, near its tuberosity, ascends on its ramus, and that of the os pubis, and the crus clitoridis, on which it is lost. Its function is to compress the crus of the clitoris, to draw it dorsad and sacrad, and thus facilitate the flow of blood into it; and by the one muscle opposing the other, they prevent the clitoris from moving to either side.

In Plate IV. of Part XI., we observe that the other muscles, the transversus perinæi q, and the transversus perinæi alter q*, the sphinter ani r, and the levator ani s,* have the same origin, course, and insertion, as in the male, which are described in page 74 of this Part.

The levator ani descends on each side of the vagina, so as to embrace it, and is partially inserted in its inferior extremity. The transversus perinæi alter q* is inserted in the labium externum and sphincter vaginæ. These muscles of the female, like those of the male, require considerable care in their dissection, in consequence of their delicate structure. As their delineation is very distinct in Plate IV., where the skin marked M is also left, in order to show the manner in which they should be dissected, it seems unnecessary to describe them further.

The proper organs of generation are the uterus and its appendages, the latter of which are the two round ligaments of the uterus, the two broad ligaments, the Fallopian tubes, the corpora fimbriata, the ovaria, and the ligaments of the ovaria.

The uterus,† marked k, in Plates I. V. VI. of Part II., and in Plates V. and VI. of Part XI., is situated in the pelvic cavity, between the urinary bladder m and the rec-

* The levator ani in the female should be carefully examined by the accoucheur, as it is concerned in parturition.

† Syn. Matrix: Womb.

tum I, and kept in this situation by the two broad, *k*, *k*, and the two round, *l*, *l*, ligaments. It is of a pyramidal figure, about two inches in length in the virgin, resembling a small flask or caoutchouk bottle, a little flattened on its pubic and sacral aspects, having a fundus k, a body *p*, a cervix *e**, and an os R, as represented in *Fig.* 1 of Plate VI. of Part XI. It consists of a peritoneal investment, *a*, a fibrous structure *b*, and a mucous lining *p*, as delineated in the same figure.

The peritoneal tunic or investment of the uterus forms also the broad and round ligaments, and all these run so much into one another, that I shall describe them at once. The peritoneum *a* in Plate V. of Part XI. is observed expanded over the fundus of the bladder m, and to glide between its posterior or sacral aspect, and the anterior or pubic aspect of the uterus k, where it ascends to the fundus of the uterus, spreading out into loose folds on each side, marked *k*. After the peritoneum has arrived at the fundus k of the uterus, and the round looking cord k*, *k**, which are the Fallopian tubes, it begins to descend in a similar manner on the sacral aspect of the uterus s, and these broad expansions *k*, *k*, as delineated in *Fig.* 1 of Plate VI. of Part XI.,† downwards between the cervix uteri and the rectum I*, on the latter of which it ascends, and spreads around the sides of the pelvis. In Plate VI. of Part XI. the peritoneum *a* is observed to extend between the rectum and uterus, even a little beyond or peripherad to the os uteri, so as to invest a very small portion of this sacral aspect of the vagina D.‡ The fold of the peritoneum

* Syn. Collum uteri.

† In *Fig.* 1 of Plate VI. of Part XI. the uterus k, with its broad ligaments, are turned round, so as to give a full view of their sacral or posterior aspect.

‡ The prolongation of the peritoneum beyond or peripherad of the os uteri hould be kept in view in extirpation of the uterus.

which extends upwards on each side from this point, and is lost on the sides of the pelvic cavity, is named, as already mentioned in page 32, plica semilunaris.* On the pubic or anterior aspect of the uterus, the peritoneum does not extend so far between the bladder and uterus, beyond or peripherad of the os uteri, but is reflected from the one viscus to the other, within half an inch of the os uteri in the adult.† This duplicature of the peritoneum is named by some authors, ligamentum uteri inferius anterius.

The broad ligaments of the uterus,‡ marked *l*, *l*, in Plates V. and VI. of Part XI., I have already described to be formed by a union of the anterior and posterior peritoneal investments of the uterus, extended transversely towards the sides of the pelvic cavity, so as to divide the pelvis into two halves, as illustrated in Plate V. This division, however, is only apparent when these ligaments are thrown on the stretch, by elevating the fundus uteri. These two laminæ

* Syn. Ligamentum uteri inferius posterius.

† The simple division of the peritoneum, where it forms an angle or fold between the urinary bladder and uterus, enables the scalpel to be carried around the os uteri in extirpation of the uterus. The uterus is sometimes absent, and at other times only one of its sides is present; occasionally, it is exceedingly small in size, with very thin parietes; a few instances have occurred where it has been divided into two lateral halves, and even where it has been divided by a longitudinal partition, so as to constitute two uteri, which partition has also in one or two cases extended to the external parts. It is subject to prolapsus, to retroversion, to inversion, to hernia, to laceration in the pregnant state, to inflammation, suppuration, ulceration, and obliteration; to polypi, which grow from its mucous membrane, investing either the fundus, body, or neck; to scirrhus and cancer, to sarcomatous tumours growing from its surface, to hypertrophy, to conversion into a fibro-cartilaginous mass, to ossification, or deposition of calcareous matter in its muscular texture, to a deposition of fat and hairs in its texture, to a deposition of teeth on its internal surface, and in its cavity. Scirrhus and cancer more frequently commence at the os and cervix than elsewhere, and the os is also subject to warty excrescences.

‡ Syn. Ligamenta lateralia uteri; Alæ vespertilionum.

of the peritoneum are intimately connected by cellular substance, and admit of no aperture, with the exception of the ovarian one *k*** of the Fallopian tube. Besides the cellular tissue connecting these laminæ of the peritoneum which form the broad ligament, it is stated by some authors that there are muscular fibres which originate from the sides of the uterus, and extend outwards, becoming gradually lost as they extend between these layers of the peritoneum. There are several arteries, veins, and nerves running between these laminæ, as described in Part II. Each of those broad ligaments *k*, in its extension from the side and fundus of the uterus, embraces the Fallopian tube, marked *k**, the corpus fimbriatum s, a production apparently of the peritoneum, the ovarium N, with its ligamentous cord *n*, and the round ligament *l*.

The round ligaments,* marked *l*, also two in number, extend from the fundus k of the uterus to the inguinal canal, as delineated in Plates I. and V. of Part XI. Each round ligament is involved in the peritoneal envelope, forming the broad ligament, and consists of the peritoneum, investing a tissue of blood-vessels and cellular substance, extending from the fundus uteri to the inguinal region. This round ligament proceeds from the fundus uteri exterior or sacrad to the peritoneum, ascends to the side of the pelvis, crosses obliquely the external iliac vein and artery, and like the spermatic cord in the male, emerges from the abdomen on the iliac and atlantal aspect of the epigastric artery at the inguinal canal, and exterior in the inguinal region, divides into several fasciculi, which are lost in the adipose substance of the mons veneris and external labium.† See Plates I. and V. Part II. Besides

* Syn. Ligamentum uteri teres.

† The practitioner should carefully attend to this vascular connexion between

the blood-vessels and cellular tissue which enter into the formation of the round ligament, it is supposed there are longitudinal muscular fibres, which originate from the muscular substance of the uterus. The peritoneum does not surround entirely the round ligament, but merely invests it in the same manner as it does any of the small intestines, as, for example, the jejunum. When the uterus, together with its ligaments, is insulated, the round ligament is very partially covered with the peritoneum, and is with difficulty distinguished. Having described these productions of the peritoneum, I shall return to the description of the uterus.

I have mentioned that all the uterus, with the exception of its mouth, is invested with the peritoneum. The os uteri projects into the fundus or upper opening of the vagina, and is surrounded by the latter; it consists of two swollen projecting labia, about an inch in extent in the virgin, arranged transversely with a horizontal aperture, and from its resemblance to the mouth of the ray or skate, is named also os tincæ.* The cervix is nearly cylindrical, and narrower than the os, being about six-eighths of an inch in diameter. The corpus or body swells out from the cervix, being about an inch and a half in breadth, and flattened on the pubic and sacral aspects, more so on the former than the latter, and having round edges or sides, and altogether a triangular appearance. The fundus is slightly arched.

Beneath or centrad to the peritoneal investment, there is the thick fleshy stratum, marked *b* in *Fig.* 1 of Plate VI., nearly half an inch thick at the body of the uterus.

the groin and the uterus, in reference to the application of leeches in suppression of the catamenia, and in hysteritis.

* Syn. Os uterinum: Orificium uteri externum.

This consists of several longitudinal muscular strata of a brownish red colour, between which are transverse or circular whitish bands, all intimately interlaced, and between which a number of extremely flexuous blood-vessels run, frequently inosculating together. The longitudinal fibres run from the fundus on the pubic and sacral aspects towards the cervix, where they disappear, some of them taking an oblique, and some even a transverse direction. The transverse fibres run in a circular direction, intimately interlacing with the longitudinal and oblique. The muscular substance is thickest at the fundus, there being very little at the cervix.

The internal aspect or cavity of the uterus, which corresponds somewhat in shape with the external, is lined with a reddish flocculent mucous membrane, marked *p* in *Fig*. 1 of Plate VI., which communicates with the vagina through the medium of the os uteri, and with the peritoneum by the Fallopian tubes. This mucous tunic adheres intimately to the muscular or fibrous substance, and can be only separated by maceration; hence some authors have denied its existence, and considered there are only exhalant vessels situated here. At the cervix there are two longitudinal projecting lines on the pubic and sacral aspects, the former of which is represented in *Fig.* 1 of Plate VI. of Part XI.; and from these, oblique lines with corresponding furrows extend upwards on each side towards the sides of the cervix. In this cervical region there is also a number of mucous glands or follicles,* situated chiefly on the inferior part.

The internal cavity of the uterus is extremely small, the pubic and sacral sides nearly touching each other; it communicates with the vagina by its mouth, which is rather

* Syn. Ovula Nabothiana: Ovarium secundarium.

larger than its cervix, and the latter of which becomes even narrower towards the body, where it is named ostium uteri internum. From this contraction the cavity swells out laterad, but not pubic and sacrad, to the fundus, where it extends to the commencement of the Fallopian tubes, the same mucous structure running along them. At the fundus, and especially where the Fallopian tubes begin, the parietes of the uterus are thinnest. The cavity of the uterus, where it begins to form these tubes, has a funnel-like shape.

The Fallopian tubes,* marked *k** in Plates V. and VI. of Part XI., form the highest or most atlantal free margins of the broad ligaments k, in which they are enveloped, and extend from the fundus uteri laterad towards the ovaria, N, N; they are flexuous tubes, between three and five inches long, small in calibre, but having thick fleshy parietes; and I have already mentioned, that they are encircled with the peritoneum, which forms at their ovarian extremities, in conjunction with their internal or mucous tunic, the elegant fringed web marked s, named corpus fimbriatum,† which surrounds the ovarian aperture *k***. Beneath or centrad to the peritoneal investment there is a layer of longitudinal muscular fibres, within which are also circular ones; and interior to this muscular layer is the mucous coat, arranged in longitudinal folds, extending from the corner of the fundus uteri to the corpus fimbriatum, the latter of which, as above mentioned, it contributes to form. The calibre of the Fallopian tube is exceedingly small at the uterus, being about half a line, and scarcely capable of admitting a hog's bristle; but from this it gradually enlarges towards its ovarian aper-

* Syn. Meatus seminarii.

† Syn. Morsus diaboli: Pavillon de la trompe: Morceau frangé.

ture,* so as to admit the common brass blow-pipe of the dissecting case, which is about four lines in diameter. The aperture at the fundus uteri is termed ostium uterinum.†

The ovarium,‡ marked N in Plate V. of Part II., and in Plates V. and VI. of Part XI., is an oval-shaped glandular-looking body, situated on the posterior or sacral aspect of the broad ligament *k* of the uterus, being also held in this situation by a ligament proper to itself, marked *n* in Plates V. and VI. of Part XI., and named ligamentum ovarii.§ This ligament *n*, is a production or duplicature of the peritoneum, together with cellular substance, which extends from the fundus uteri to the one extremity of the ovarium N. The ovarium is invested with a peritoneal envelope, continuous with the posterior or sacral lamina of the broad ligament of the uterus; it is about an inch and a half long, and about half an inch in diameter, being nearly of the same breadth and thickness; and its inferior or coccygeal margin is described as being more straight than the superior or atlantal, and having a slight concavity.‖

Beneath its peritoneal investment there is a white fibrous membrane, named tunica albuginea, both of which are intimately adherent; and this white tunic is pierced at the lower border of the ovarium with the blood-vessels which go to and from this body. On making a section of the ovarium N*, as delineated in *Fig.* 1 of Plate VI. of Part XI., we perceive a number of vesicles, which

* Syn. Ostium abdominale.

† The uterine aperture of the Fallopian tube is sometimes obliterated; calcareous concretions are occasionally found in the Fallopian tube; and a fetus is sometimes developed in it, constituting a tubal conception.

‡ Syn. Testis muliebre.

§ Syn. Ligamentum rotundum ovarii.

‖ Syn. Hilus; Scissure vasculaire.

vary from eight to twenty in number, imbedded in a brownish red substance, tolerably solid and firm, and plentifully supplied with blood-vessels.

The vesicles of the ovarium* vary in size, the largest being about three lines in diameter, and they are found more abundant on the surface than in the centre of the ovarium. They consist of a clear limpid fluid, encased in a thin serous membrane, which adheres to the substance of the ovarium.†

The nerves and blood-vessels to the female organs of generation are described in Part II.

* Syn. Ovula Graafiana.

† The ovaria are subject both to misplacement and to disease; they are occasionally found at birth exterior to the inguinal canals, forming hernia, in which case they are sometimes mistaken for testes; and if the clitoris be very large, with the urethra immediately at its root, and the vagina small or the sides adherent, the combination is liable to be considered hermaphrodism. The ovaria are sometimes very small, and sometimes one or both are deficient. The vesiculæ are occasionally absent. The ovaria are subject to inflammation, suppuration, and ulceration, to hypertrophy, dropsy, an albuminous collection, sarcoma in all its forms, a deposition of teeth and hairs, and to ovarian conception.

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OF

THE LETTERS OF REFERENCE

IN

PART XI.

MALE AND FEMALE ORGANS OF GENERATION.

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B, Section of os sacrum
C, Os coccygis
D, Triangular space of urinary bladder, formed by vasa deferentia and peritoneum
E, Membranous portion of urethra
F, Bulb of urethra
G, Corpus spongiosum urethræ
H, Meatus urinarius
I, Rectum
K, Glans penis
L, Prepuce
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N, Frenum
O, Spermatic vein
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X, Corpus cavernosum penis
Z, Scrotum

b, Tunica vaginalis testis
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r, Body of testis
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v, Vas deferens
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E, Membranous portion of urethra
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K, Glans penis
K*, Glans penis laid open
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P, Cellular tunic of urinary bladder
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U, Urethra
h, Meatus urinarius
t, Prostate gland laid open
t, Caput galinaginis
w, Ureter
w*, Entrance of ureter in [illegible]nary bladder
x, Corpus cavernosum penis l[illegible] open

Fig. 2.

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q*, Transversus perinæi alter muscle
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70, Ligamentum suspensorium labiorum

PLATE V.

A, Mons veneris
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T, Corpus spongiosum urethræ
V, Spongy structure of vagina

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PLATE VI. *Fig.* 1.

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PLATE VI. *(Continued.)*

D, Mucous tunic of vagina
D*, Inferior commissure of vagina
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F, Nymphæ
G, Glans clitoridis
H, Preputium clitoridis
I, Rectum
I*, Rectum
I**, Anus
K, Meatus urinarius
L, Carunculæ myrtiformes
N, Ovarium
N*, Ovarium laid open
P, Cellular tunic of urinary bladder
Q, Mucous tunic of urinary bladder
R, Os uteri
S, Corpus fimbriatum
S*, Whale-bone probe inserted in ureter

U, Urethra
V, Spongy structure of vagina

g, Crus clitoridis
k, Fundus uteri
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a, Peritoneum
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*k**, Fallopian tube
*k***, Ovarian aperture of Fallopian tube
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p, Mucous tunic of uterus

Fig. 2.

B, External labium
G, Glans clitoridis
H, Preputium clitoridis

g, Crus clitoridis

d, External aspect of mucous tunic of vagina
f, Vascular plexus of vagina

A

SYSTEM

OF

ANATOMICAL PLATES;

ERRATA AND OMISSIONS.

In page 15, continuation of the foot note, after abdominal viscera, *read*, The omentum majus is subject to inflammation, suppuration, induration, ossification, hydatids, and sarcomatous tumours. Adhesions between this web and the peritoneum investing the anterior parietes of the abdomen not unfrequently result, and bridle the intestines in such a manner as to produce internal ventral hernia. Adhesions also take place between the omentum and the small intestines.

In page 22, 9th line from the top, *for* page 15, *read* page 16.

In page 24, 6th line from the top, *for* page 15, *read* page 16.

In page 26, 16th line from the top, *for* in pages 15, *read* in pages 16.

In page 27, 10th line from the top, *for* in page 16, *read* in page 17.

In page 32, 3d line from the top, *for* page 16, *read* page 17.

In page 34, end of 2d foot note, after cancer, *read*, Hemorrhoids also occur here.

PART XII.—GRAVID UTERUS, AND LYMPHATICS.

EDINBURGH:
PRINTED FOR DANIEL LIZARS, 5 ST. DAVID STREET,
(LATE 61 PRINCES STREET);
S. HIGHLEY, 174 FLEET STREET, AND WEBB STREET, ST. THOMAS'S
HOSPITAL, LONDON; AND W. CURRY, JUN. & CO.
9 UPPER SACKVILLE STREET, DUBLIN.
1826.

EDINBURGH:
Printed by John Brewster,
11, Society.

CONTENTS.

GRAVID UTERUS.

THE description of the uterus in the gravid or impregnated state naturally follows that of the organ in the virgin state, and I shall therefore proceed to describe the gravid uterus at the ninth month, or full period of utero-gestation, and afterwards the fetus at the same age.

At the ninth month of utero-gestation, as represented by Plates VII. and VIII., the uterus K has risen out of the pelvic cavity, and rests on the pubes A; has elevated the floating viscera, particularly the jejunum and ileum L, near the diaphragm, and even raised the liver and spleen a little atlantad, so that all of them press on this muscular partition, and reduce the cavity of the thorax. The jejunum and ileum are also pressed laterad of the uterus. The anterior parietes of the uterus K, are in immediate contact with the peritoneum *a*, investing the anterior and lateral parietes of the abdominal cavity.* The uterus

* The close connexion of the anterior parietes of the abdomen with the uterus should be kept in view in the cæsarian operation. At the sixth month the small intestines have been found between the interior parietes and the uterus, but never at the ninth month.

has by this time acquired a great magnitude, is entirely changed in its shape and appearance, being of an oval figure; its cervix E is now obliterated by the distension; and its fleshy parietes are considerably increased in thickness, as represented in Plate VIII., the section being marked *b*. The Fallopian tubes *k**, have also become shorter, thicker, and more fleshy; the peritoneum has increased with the uterus, and, in only very few instances, has been found elongated and somewhat thinner than elsewhere; the spermatic and uterine arteries, with their corresponding veins, are enormously enlarged; the hypogastric plexus, and the abdominal muscular twigs of the lumbar nerves, are augmented; and the lymphatics are likewise increased greatly in magnitude.

On making a section of the parietes of the uterus, as exemplified in Plate VIII., we perceive them, (marked with the letters *b*,) remarkably thick and fleshy, and interspersed with numerous large foramina, which are the bisected blood-vessels, now enormously enlarged; we observe them invested with three membranes, marked *f*, *d*, *c*; and interior to the last, the fetus and placenta *p*, with their medium of connexion, the umbilical cord, marked *n*, *n*, g. The membranes * are the decidua *f*, the chorion *d*, and the amnion *c*.

The decidua,† marked *f* in Plate VIII., and in *Figs.* 1 and 9 of Plate IX., invests the inner or concave surface of the uterus *b*, and the outer or convex surface of the chorion *d*, forming a complete sac, somewhat similar to the peritoneum, excepting at the os uteri, where the uterine lamina does not extend across this aperture, but

* Syn. Secundæ Secundines: Involucra: Membranæ: Les enveloppes: Délivre.

† Syn. Membrana caduca: Tunica exterior ovi: Membrana Hunteri: Membrana cribrosa: Epichorion.

here ceases, the os uteri being shut up by a gelatinous substance. These two laminæ unite round the margin of the placenta *p*. That portion investing the uterus, is named the decidua externa or vera; while that which invests the chorion, is called the decidua interna or reflexa.* The surfaces of these laminæ, looking to each other, are serous, whereas the surfaces which adhere to the uterus and to the chorion, may be said to be cellular. That portion adhering to the uterus has a number of flocculent processes, which seem to be the blood-vessels that supply it, being derived from the uterine vessels, and entering this membrane in an oblique direction, running in beautiful serpentine convolutions; while that which adheres to the chorion requires some degree of putrefaction in order to separate it. The decidua is of yellowish colour, resembling coagulable lymph, is soft and spongy, having in some places a cribriform appearance, particularly where it invests the chorion opposite the os uteri.

The chorion,† marked *d* in Plate VIII., and in *Figs*. 1, 2, 3, 4, 7, 8, and 9, of Plate IX., is situated immediately internal or central to the decidua *f*, which it invests, and exterior or peripheral to the amnion *c*, to which it also adheres. It is a thin pellucid membrane, having delicate villous prolongations on its two surfaces, especially on the outer, as represented in *Fig*. 8 of Plate IX., which are blood-vessels derived from the umbilical vessels. Where it invests the placenta, it is thicker, affording a coating to its blood-vessels, and extends along the umbilical cord, onwards to the fetus, where it is lost in the integuments. Some authors describe the chorion to consist of two laminæ, between which run small blood-vessels.

* Syn. Chorion fungosum.
† Syn. Chorion pellucidum: Membrana vasculosa: Membrana extima.

The amnion,* marked *c* in Plate VIII., and in *Figs.* 1, 2, 4, and 9, of Plate IX., is situated immediately within or centrad of the chorion *d*, to which it adheres by delicate gelatinous substance, analogous to cellular tissue, and at the placenta it extends along the umbilical cord onwards to the fetus, where it blends with the integuments, particularly the epidermis. It is a thin transparent membrane, but tougher in its texture than either the chorion or decidua, and has an internal serous surface towards the fetus.

Within the amnion, is contained a clear limpid fluid, named the liquor amnii, which is generally about eight ounces in quantity at parturition, and is then more or less muddy and flocculent. Its situation may be comprehended by examining *Figs.* 7 and 9 of Plate IX., where, in the latter, the decidua *f* and chorion *d* are laid open, and the amnion *c* containing its liquid left entire; while in *Fig.* 7 both amnion and chorion *d* are left sound.†

The placenta, marked with the letters *p* in Plate VIII., and in *Figs.* 1 and 9 of Plate IX., is situated generally at the superior and posterior part of the fundus of the uterus, a little towards the right side, adhering to the inner surface of the uterus through the medium of the decidua.‡

In *Fig.* 1 of Plate IX., which is a view of this body the full size of life, we observe that it is a soft flat mass, of

* Syn. Tunica ovi intima: Amnios.

† The amnion is occasionally separated from the chorion in the early months of gestation, by a deposition of fluid, which is named the false water of the amnion. This, however, generally disappears between the second and third month.

‡ The placenta sometimes adheres to the uterus so near the cervix, as to impede the advancement of the fetus at birth, and produce hemorrhage, which may prove fatal both to the mother and fetus.

a roundish oval figure,* about eight inches in length, and from six to seven in breadth, and one in thickness, being thickest in its centre, and becoming gradually thinner towards its circumference; it is invested on this surface, which looks to the fetus, with the amnion, chorion, and decidua; and on its uterine surface, simply with the latter. On the uterine aspect, however, it is rough and irregular, from the decidua being generally detached at parturition. It consists of a profusion of blood-vessels, the divisions of the two umbilical arteries *n*, *n*, and the umbilical vein g, distributed in a delicate parenchymatous substance, which is subdivided by productions of the decidua from both surfaces, so as to give it a lobulated appearance; each tissue of veins and arteries forming a lobulus,† the veins being much more numerous than the arteries. These lobules, of an irregular round shape, are very distinct on its uterine aspect, and vary very much in size. Besides the decidua on its uterine surface, there is another soft stratum, termed the parenchymatous substance, resembling it very much, which is situated between the decidua and these lobules, and which extends from lobule to lobule, and penetrates between them. By some authors the placenta is divided into a uterine and fetal portion, with the intervention of a cellular structure, like that of the corpora cavernosa penis; but this is evidently incorrect, for, not until the mass is very putrid, can we in the least separate it into two portions; and, as even Dr. Hunter himself observes, "In a placenta of nine months, I have never been able to separate the two constituent parts otherwise than by some degree of putrefac-

* The placenta is sometimes very oblong, and at others triangular, and even very irregular, being like two united by an isthmus, or having one or two small lobes appended to it.

† Syn. Cotyledone: Lobe.

tion, and gentle rubbing and washing; but this operation always destroys the uterine portion, which is more tender, and melts down by putrefaction sooner than the other."

From experiments lately performed by Dr. Lauth,* vessels have been discovered between the interior surface of the uterus and the decidua, which he considers to be lymphatic. "On examining with care," says he, "a placenta still covered by the deciduous membrane, it will be seen that these two parts are united with each other, by a multitude of small transparent vessels which proceed from the one towards the other. These vessels can be injected neither by those of the placenta, nor by those of the membrana decidua; but a very fine tube inserted into either, allows at one time the vessels of the decidua, at another those of the placenta, to be injected. From this it follows, 1*st*, That the vessels are of two orders, the one belonging to the decidua, and consequently to the uterus, and the other to the placenta; 2*dly*, That these are not blood-vessels; and, 3*dly*, That these terminate, the one in the blood-vessels of the membrana decidua, and the other in those of the placenta, by orifices provided with valves, which impede their being injected from behind."† It is probable, from the observations of Uttini,‡ Michaelis,§ and Lauth, that lymphatics exist in the placenta.

The umbilical cord,‖ marked g, *n*, *n*, in Plate VIII.,

* Repertoire d'Anatomie et de Physiologie Pathologiques.

† The decidua which invests the uterine surface of the placenta, and the umbilical arteries in its neighbourhood, frequently becomes cartilaginous, or has calcareous depositions in it at parturition; the placenta also becomes occasionally scirrhous, points of consideration for the accoucheur; and hydatiform vesicles are occasionally found throughout the substance of the placenta.

‡ Uttini Memoria dell Instituto Nationale Italiano.

§ Michaelis Observat. circa placentæ ac funiculi umbilici vasa absorbentia.

‖ Syn. Funis vel funiculus umbilicalis.

and in *Fig.* 1 of Plate IX., is situated within the amnion *c*, floating in its liquid, and extends generally from near the centre* of the placenta *p* to the umbilicus of the fetus, twining round the neck of the latter, and varying from fifteen to twenty-four inches in length.† It consists of the two umbilical arteries *n*, *n*, and the umbilical vein g, beautifully entwining around each other, and invested with the amnion‡ and chorion, which are here transparent and gelatinous. Beneath the chorion and amnion there is a still greater quantity of this gelatinous substance,§ varying very much in quantity in different individuals. The umbilical vein, g, begins by small branches in the placenta, which communicate with the vascular system of the mother, by means of lymphatics, as explained in page 6, and probably also by venous absorption, through the medium of the multiplied radicles of the veins; these veins progressively become larger, unite freely with each other, and ultimately congregate to form that marked g, which proceeds along the umbilical cord, generally in its centre, the arteries twining round it,‖

* Great irregularity exists in the point of origin of the umbilical cord from the placenta; sometimes it originates precisely in the centre, but more commonly a little to the one side, sometimes at the very edge, at other times at the one end, and at others, again, not for some distance from the edge—the vessels, in this latter case, not having concentrated to form the cord, until they have run along the convex aspect of the membranes between the decidua and the chorion. In these cases the vessels form several centres.

† The umbilical cord is subject to great irregularity in its course about the fetus, and hence the circulation is frequently stopt for such a length of time, during parturition, as to prove fatal to the fetus. The funis is also occasionally twisted so as to form a perfect knot, which likewise sometimes proves fatal to the fetus during parturition. It likewise varies very much in its length, and frequently has nodosities here and there.

‡ Syn. Vagina umbilicalis.

§ Syn. Gelatina Whartoniana.

‖ The vein sometimes encircles the arteries, and sometimes the three vessels encircle one another.

to the umbilicus of the fetus, where it enters and proceeds between the anterior muscles of the abdomen, in the line of the linea alba, and in the duplicature of the peritoneum which forms the suspensory ligament of the liver, to the umbilical fissure, where it divides into several branches, from fifteen to twenty in number, one of which runs downwards in the fissure to join the vena cava ascendens *i*, as delineated in *Fig.* 6 of Plate II. of Part II., and is named ductus venosus ;* the other branches enter the liver, with the exception of one that joins the vena portæ. No valves exist in the course of the umbilical vein, but one is found where it divides at the liver of the fetus, and another where the ductus venosus joins the vena cava. No inosculation takes place between the umbilical vein and the arteries in their progress along the cord. The smaller veins in the placenta intermingle with the arteries, the one crossing and encircling the other in a beautiful manner.

The umbilical arteries *n*, *n*, originate from the internal iliac arteries of the fetus, as represented in *Fig.* 6 of Plate II. of Part II., and described in page 35 of the same Part. They ascend behind the peritoneum, along the parietes of the pelvis, and the sides of the urinary bladder, to the anterior walls of the abdomen, where they still run peripheral or exterior to the peritoneum, atlantad or upwards to the umbilicus, at which aperture they emerge, and run along the umbilical cord, twining round the vein g, as delineated in Plate VIII., and in *Fig.* 1 of Plate IX. of Part XII., onwards to the placenta *p*, where they branch out into several vessels, many of them inosculating, and the ultimate divisions terminating in the commencements of the umbilical vein. These two umbilical arteries generally anastomose very freely just where they begin to branch out on the placenta.

* The ductus venosus sometimes joins the venæ hepaticæ.

According to the interesting investigations of that indefatigable philosopher Sir Everard Home,* nerves have been discovered supplying the placenta and umbilical cord. Those of the latter run in the gelatinous substance between the blood-vessels. They have been also seen by Chaussier and Ribes to proceed from the great intercostal nerve of the fetus, along the umbilical cord to the placenta.† Lymphatic vessels have been found on the umbilical cord by some anatomists, but they are denied by others.

I shall now proceed to describe the condition of the fetus at its full developement, or at the ninth month.

Its osseous, muscular, vascular, and nervous systems have been already described in the respective Parts wherein these subjects are treated of.

The umbilical aperture is merely a foramen in the linea alba, which becomes closed when respiration takes place at birth, throwing into action the abdominal muscles. The tendinous fibres, however, of the lateral muscles, especially those of the external oblique, cross each other around this aperture, as described in page 3 of Part IV., the more effectually to shut it up after birth.

The fetus, enveloped by the membranes, is situated in the uterus, being immediately surrounded by the amnion and its fluid; and in the last month of gestation, near the period of parturition, it has an oblique position, its back towards the left side of the mother, its head towards the os uteri, resting on the pubes, the chin touching the breast; its upper extremities also resting on the breast, and gently bent; its lower extremities gently bent, the patellar aspect of the thighs touching the abdomen, and

* Phil. Trans. for 1825, Part I.

† Experiences Nouvelles sur le Digestion, et Remarques à ce Sujet dans Journ. Univ. des Sciences Med. t. i. p. 233.

the heels the popliteal aspect of the thighs, with its feet towards the placenta, and crossing each other in order to occupy the smallest possible space, and to conform to the shape of the uterus, being, like it, of an oval figure, as represented in Plate VIII. This is the natural position of the fetus immediately prior to parturition, but a great variety exists, constituting the many different cases of labour, as those of the face, breech, and foot.

It is commonly about twenty-two inches long, and weighs from eight to fifteen pounds. The skin is of a bluish violet colour, and covered with a white sebaceous substance, particularly the head, back, axillae, and groins.

The thoracic cavity is much smaller, relatively speaking, than in the adult, in consequence of the lungs being collapsed; and the diaphragm is loose and flaccid. The thymus gland, a large glandular mass, consisting of two oblong lobes, united at their sacral aspect, but free at their atlantal aspects, where they extend on the sides of the trachea, is situated in the anterior cavity of the mediastinum, as described in page 11 of Part II., and extends also upwards or atlantad in the neck, towards the thyroid gland. It rests in some degree on the pericardium and large blood-vessels of the heart, and also on the left subclavian vein; it is of a whitish yellow colour, and consists of a number of small vesicles, containing a milky coloured fluid, surrounded and connected together with a tolerably thick and strong cellular tissue. A number of small blood-vessels are distributed to this gland, but no excretory ducts have been traced from it.

The lungs are collapsed and solid, and of a purplish colour, none of the blood in the fetus having been yet oxygenated. The foramen ovale exists in the septum auriculorum of the heart, as described in page 3 of Part II.; and, in page 5 of the same Part, the pulmonary

artery is described to have a central branch, named the ductus arteriosus, which extends to the arch of the aorta. The pulmonary veins are collapsed, and to appearance much smaller than natural.

The head bears a greater proportion to the rest of the fetus than in the adult.

The abdomen is also larger and more prominent in proportion, chiefly in consequence of the magnitude of the liver. The liver bears a considerably larger proportion to the other viscera than it does in the adult, and particularly the left lobe, which is even larger than the right, and extends into the left hypochondriac region; the free margin of the liver descending almost to the umbilicus. Its texture, which is of a deep red colour, is exceedingly soft and pulpy. In the earlier stage of the fetus, there is merely a mucous fluid found in the gall bladder, and not until a short period before birth is there any biliary fluid secreted. The course of the umbilical vein, and its branches which enter into the substance of the liver, have been described.

In the intestinal canal there is a peculiar glairy substance, of a greenish colour in the small, and blackish in the large intestines, which is termed meconium.* The supra-renal glands are considerably larger in the fetus than in the adult. The urinary bladder rises more into the abdominal cavity than in the adult, in consequence of the shallowness of the pelvis. The urachus is more conspicuous; and the umbilical arteries, as already described, are the largest branches of the internal iliacs. These are the chief peculiarities in the fetus at

* The colour of this substance should be attended to when operating on a child born with an imperforated anus.

the full period of gestation, the rest having been described in the different Parts on the other viscera of the adult.

My original intention was to describe the gradual changes which the uterus undergoes during gestation, and the progressive developement of the fetus; but I found that these so involved the physiology of generation, that it was impossible to give the one without the other. I shall therefore abandon describing these at present, as it will be much more satisfactory to give them under the physiology of generation.

LYMPHATIC,

OR

ABSORBENT SYSTEM.

The lymphatic system consists of an elaborate set of vessels, being more numerous than either the arterial or venous, and of a number of glands distributed in various parts in the course of these vessels.

The lymphatics consist of a superficial and a deep set of vessels, throughout not only the head and extremities, but even all the viscera of the thorax, abdomen, and pelvis. Some of them, almost as soon as they originate, at once join the veins in the capillary tissue, others join the veins in the lymphatic glands, while others again concentrate to form the thoracic duct, which ultimately also joins the venous system. Every venous or arterial

trunk is generally accompanied with several lymphatics, commonly ten in number; and all the lymphatic vessels have valves somewhat similar to those of the veins.

The lymphatics situated on the alimentary canal are named lacteals,* and both these and the other lymphatics are also termed absorbents.

The lacteals are those lymphatics or absorbents situated on the intestinal canal, being named so from the commencement of the duodenum to the termination of the rectum. But there are other absorbents which carry the lymph from the tissue of the intestines, and which are simply named lymphatics, although they take the same course. They are subdivided into lactea primi generis, and lactea secundi generis. The lactea primi generis are those which extend from the intestines to the lymphatic glands situated in the folds of the mesentery; and the lactea secundi generis are those which extend from the lymphatic glands to the thoracic duct.

In order to give a connected description, I shall begin with the lymphatics of the stomach. These arrange themselves into three fasciculi, those of the left side, those of the lesser curvature, and those of the greater arch. The lymphatics of the left side originate at the larger extremity or cul-de-sac of the stomach, where they are joined by some of those of the omentum majus, accompany the vasa brevia of the splenic artery to its trunk, where they terminate in the lymphatics of the spleen. The lymphatics of the right side or greater arch originate from this region of the stomach and the omentum majus, accompany the arteria gastro-epiploica dextra, running through several small lymphatic glands in their course, to the dorsal aspect of the pancreas, where they unite be-

* Syn. Vasa chylifera.

tween the cœliac and superior mesenteric arteries with the lacteals of the intestines, in order to form one of the principal branches of the thoracic duct. These lymphatics of the greater arch also inosculate in their course with those of the lesser arch. The lymphatics of the lesser arch originate near the pyloric orifice of the stomach, where they anastomose with those of the greater arch; accompany the gastric artery to the cardiac orifice, running through several lymphatic glands; and concentrating, they descend to the root of the liver, where they join the lymphatics of this organ, and terminate in the thoracic duct. These lymphatics of the stomach will be found chiefly to accompany the arteries of the stomach, and, before concentrating, to run both superficially and deep seated; the superficial arising between the peritoneal and muscular coats, and forming numerous inosculations; the deep seated originating between the muscular and villous tunics, and uniting with each other, and also with the superficial set. In this course, these lymphatics communicate or run through several lymphatic glands,* some of which are situated on the lesser concave arch in the course of the gastric artery, others on the greater convex arch in the course of the arteria gastro-epiploica dextra et sinistra, also in the course of the vasa brevia. These glands are small and few in number, being seldom more than five or six on each arch.

The lymphatics or lacteals of the small intestines are very numerous, more so than those of the stomach or the large intestines, and abound more in the duodenum than in the jejunum or ileum, and more in the jejunum than in the ileum. They consist of a superficial and deep seated set; the deep seated originating from the

* Syn. Glandulæ ventriculi superiores et inferiores: Glandulæ stomacho-epiploicæ: Les glandes gastro-epiploïques.

mucous coat, from the villi or radicles which absorb the chyle, described in page 23 of Part XI. They run between the mucous and muscular tunics, around the intestine in a circular manner, some of them piercing the muscular coat and uniting with the superficial set in this region, while others run between the peritoneal folds forming the mesentery, and there unite with the superficial. This latter set derive their origin between the muscular and peritoneal coats, where, as already observed, they form inosculations with the deep seated lacteals, and extend first in a longitudinal manner along the intestinal canal, as delineated in Plate X., marked with the digits 12, uniting with each other in various directions, and ultimately joining the deep seated set in the folds of the mesentery. The two sets unite and concentrate, and run in the course of the superior mesenteric artery, marked R in Plate X. of Part XII., piercing or communicating with the mesenteric glands, marked with the digits 3. In their course along the trunk of the superior mesenteric artery R, these are joined by the lymphatics of the ascending O, and transverse P, portions of the colon, marked with the digits 13, which vessels arise and run in a similar manner to those of the small intestines, being only much less numerous. The whole are now generally concentrated into two, three, or four vessels, which accompany the superior mesenteric artery to the pancreas, where they inosculate with the lymphatics of the pancreas, liver, and spleen, and form one of the chief branches constituting the thoracic duct, marked with the digit 1. The lymphatics of the sigmoid flexure Z of the colon, and the rectum 1*, take a different course; those of the colon join the lymphatic glands in the sacral and lumbar regions, and those of the rectum, the lymphatics in the sacral and iliac regions, both of them ultimately terminat-

ing in the lymphatic trunks of the lower extremities which contribute to form the thoracic duct.

These lymphatic vessels, in their course from the small and large intestines, pass through or communicate with a number of lymphatic glands, which are named mesenteric and mesocolic, from their situation. The mesenteric, marked with the digits 3, are chiefly situated on the sinistral aspect of the superior mesenteric artery R, and are much more numerous and larger than the mesocolic, marked with the digits 2, being estimated by some authors to be upwards of a hundred in number. The glands communicating with the lymphatics of the jejunum K, are better developed than those of the ileum, and those near the intestine are smaller and more apart than those near the trunk of the artery.*

The lymphatics of the liver I, i, are extremely numerous, small, and have less perfect valves, so that they can be injected from their trunks, and arrange themselves into deep and superficial sets. The superficial set of lymphatics is distributed on the convex and concave aspects; those on the convex surface arrange themselves into three fasciculi, a right, a left, and a middle. The right fasciculus extends over the convex surface of the right lobe I, runs towards the right lateral ligament, where it pierces the diaphragm, and enters the thoracic cavity, some of the branches joining the thoracic duct 1, others inosculating with the inferior lymphatics of the diaphragm, while others again advance sternad to unite with the middle fasciculus after its entrance into the thorax. The left fasciculus occupies the greater extent of the convex surface of the left lobe i of the liver, runs towards the left lateral liga-

* The mesenteric lymphatic glands are subject to inflammation, suppuration, scrophulous enlargement, scirrhus, cancer, osseous concretions, earthy concretions, and the various species of sarcoma.

ment, and joins the lymphatics of the lesser concave arch of the stomach, as described in page 14. The middle fasciculus derives its origin partly from the left and partly from the right lobe of the liver, runs along the suspensory ligament, and pierces the diaphragm near the sternum: having entered the thoracic cavity, its vessels, about six in number, inosculate with the lymphatics in this region of the diaphragm, and concentrate in forming two or more trunks, which run in the folds of the mediastinum, uniting with the lymphatics of the pericardium and pleura sternalis, onwards to the thoracic duct near its termination. Sometimes a few vessels of this fasciculus run on the left of the suspensory ligament towards the coronary ligament, and join other lymphatics of the liver between the left lobe and diaphragm, which descend to the thoracic duct in the abdomen.

The superficial lymphatics on the concave surface of the liver, marked with the digits 14, in Plate X., are not so numerous as those on the convex aspect, with which they inosculate. They run along the concave surface i; those on the right lobe uniting with those on the left i, and also with the deep lymphatics towards the vena portæ, along which they extend and unite with the lymphatics of the intestines. Some of these latter lymphatics of the liver at once pierce the glandular substance and unite with the deep-seated set.

The deep-seated lymphatics of the liver, much more numerous than the superficial, accompany the divisions of the vena portæ, hepatic artery, and hepatic duct, and emerge at the fossa of the vena portæ, accompanying this vessel to the root of the mesentery, where they unite with the lymphatics of the intestines, to form one of the chief sources of the thoracic duct; and forming in this course inosculations with the lymphatics of the lesser arch of the

stomach, and those of the pancreas and spleen. These lymphatics pass through or communicate with several lymphatic glands situated in their course along the trunk of the vena portæ.*

The lymphatics of the spleen consist of a superficial and deep set, the former of which being very small, originating from, and encircling its convex surface, descend towards the entrance of the splenic artery, where they are joined by the deep-seated lymphatics of considerable magnitude, and from thence both proceed along and around the artery. In their progress along the splenic artery, they are joined by the superficial and deep-seated lymphatics of the pancreas, and then proceed to join the lymphatics of the intestines, inosculating with those of the stomach, as described in page 13.

The thoracic duct,† marked with the digit 1 in Plate XV. of Part X., and in Plate X. of Part XII., is formed by this concentration of the lymphatics of the stomach, intestines, liver, spleen, and pancreas, together with the two trunks of the lymphatics of the lower extremities and the other viscera of the abdomen and pelvis, and is generally first observable in the region of the first, second, or third lumbar vertebra, between the fleshy pillars of the diaphragm, dorsad of the aorta, and atlantad of the right renal artery. Here, or a little atlantad, it commonly becomes a little enlarged, and has been named the receptaculum chyli;‡ but more frequently there is merely a sort of varicose appearance. From this region the thoracic duct 1, ascends behind the aorta a little dextrad, and enters the thoracic cavity between the aorta

* These lymphatic glands are sometimes so tumefied, that they obstruct the course of the biliary fluid along the ducts, and produce icterus.

† Syn. Left thoracic canal: Le canal thoracique, proprement dit.

‡ Syn. Cysterna chyli: Reservoir of Pecquet: Saccus lacteus of Van Horn.

and the right crus of the diaphragm; then ascends in the posterior cavity of the mediastinum, between the aorta and vena azygos 5*, to the fifth dorsal vertebra, where it runs sinistrad obliquely behind or dorsad to the œsophagus I, the descending aorta E, and its arch, to the root or origin of the left carotid artery P, dorsad to which, and sinistrad of the œsophagus, it ascends to the second or first dorsal vertebra, where it mounts to the left internal jugular vein, forming a circular turn. Here it generally splits into two branches, which, after proceeding a very short distance, again unite and run dorsad to this vein to the sinistral aspect of its termination, where the duct joins the left subclavian vein, by entering its atlanto-dorsal or superior posterior aspect; the internal serous tunic of the vein forming a semilunar valve, which covers two-thirds of the orifice of the duct. In this course, the thoracic duct having few valves, occasionally divides and unites again more than once, particularly where it crosses from right to left in the thoracic cavity, and in this course it is also joined by several branches, the lymphatics of the pleura, intercostal spaces, and the lymphatics of the lungs, the lymphatics of the heart, and the lymphatics of the left superior extremity, and left side of the head.

The lymphatics of the pleura arrange themselves into anterior and posterior. The anterior * commence upon the thoracic aspect of the diaphragm, where they are joined by the lymphatics on the atlantal and sternal aspects of the integuments and muscles of the abdomen, which pierce the diaphragm at the ensiform cartilage; from this they ascend on each side of the sternum, in company with the internal mammary artery, those of the left side concentrating in one or two trunks, and continuing to ascend before or sternad to the left subclavian vein, where it joins

* Syn. Internal mammary lymphatics.

the thoracic duct, or terminates at once in the vein itself. In this course they are joined by lymphatic vessels between the intercostal spaces,* and run through several lymphatic glands in their course, especially those situated in the lower or sacral region of the neck. The lymphatics on the right side of the sternum take the same course, in company with the internal mammary artery of that side, and are joined by the intercostals of the same side; but they either terminate in the venous system, at the junction of the right internal jugular and right subclavian veins, or unite with the lymphatics of the right upper extremity and right side of the head.

The posterior set of lymphatics, marked with the digits 4 in Plate X., accompanies the intercostal arteries,† receiving, in its course towards the spinal column, several lymphatic vessels from the pleura, and intercostal muscles. They run between the ribs, and terminate in the thoracic duct, during its progress in the thoracic cavity, inosculating in their course with each other, especially around the aorta, with the lymphatics of the spinal canal, and running through several lymphatic glands, and also communicating with the lymphatic glands of the lungs.

The lymphatics of the lungs are arranged into superficial and deep-seated. The superficial set, marked 18 in *Fig.* 1 of Plate XI., originates on the pleura pulmonalis, and forms a complicated plexus, which runs between the lobes, inosculating with the deep set, and on the mesial aspect towards the bronchial glands, marked b. The deep-seated lymphatics derive their origin from the interlobular substance, where they inosculate with the superficial, and accompany the branches of the pulmo-

* Syn. Anterior intercostal lymphatics.

† Syn. Posterior intercostal lymphatics.

nary vessels, and the ramifications of the trachea, and run through the bronchial glands.* At the first division of the trachea K, the lymphatics of the left side, which are more numerous than those of the right, ascend along the left subclavian vein *v*, to the left internal jugular M, and either terminate in one of these veins, or in the thoracic duct, or in the lymphatic trunks of the left side of the neck or upper extremity. In this course these lymphatics are joined by those of the pericardium, and run through several lymphatic glands situated on the trachea.

The lymphatics of the right lungs, fewer in number than those of the left, after passing through the glands on the trachea, concentrate into one, which is joined by the lymphatics of the pericardium, anterior mediastinum, and heart, and ascend to terminate in the right internal jugular or subclavian vein.

The lymphatics of the pericardium are few, and run between the laminæ of the mediastinum to join those of the lungs. In the fetus, the lymphatics of the thymus gland have the same course and termination.

The lymphatics of the heart, marked with the digits 20 in Plate X., are divided into superficial and deep-seated. The superficial accompany the coronary arteries *r*, *s*, and in their progress are joined by the deep-seated lymphatics. Those which accompany the left coronary artery *s* are more numerous, and ascend on the aorta E, inosculating with those of the right side, and join the thoracic duct 1. The lymphatics accompanying the right coronary artery *r*, proceed to the pulmonary

* The bronchial glands, particularly those near the bifurcation of the trachea, are subject to scrofulous enlargement, to inflammation and suppuration, constituting phthisis pulmonalis, to calcareous concretions, to osseous depositions, and to scirrhus.

lymphatic trunk, which terminates in the right subclavian vein. In this course these lymphatics of the heart run through lymphatic glands situated on the aorta.

Besides the lymphatic glands already described in the thoracic cavity, there are some situated between the intercostal muscles; in the course of the internal mammary artery; between the laminæ of the anterior mediastinum; in the posterior cavity of the mediastinum; in the course of the œsophagus and aorta; and in the substance of the lungs, as described in page 9 of Part II.

The lymphatics of the upper extremity are arranged, like the preceding, into superficial and deep-seated. The superficial may be divided into the palmar and anconal. The anconal or posterior set commences on the back, or anconal aspect of the fingers, runs on their radial and ulnar margins, uniting in the course upwards or proximad along the cutaneous veins of the back of the hand, with the lymphatics on the palmar aspect. As they ascend proximad, they encircle the fore-arm on each side, and run on the palmar aspect at the bend of the arm, where they unite with the superficial palmar set. This latter set of lymphatics, marked with the digits 21, in *Fig.* 2 of Plate XI., begin on the palmar aspect of the fingers, run along the ulnar and radial margins, uniting with those on the anconal aspect, concentrate at the palm of the hand into three or four vessels, which continue to ascend proximad on the palmar aspect, several of them running on the cephalic r, and median s veins, to the bend of the arm, where they unite with the anconal set, run through the lymphatic glands in this region, marked 2, and then ascend chiefly in company with the brachial vein u, and artery h, to the axillary glands, marked with the digits 3. Some accompany the cephalic vein r throughout its course, to its termination

in the axillary vein *u*, and then join either the axillary 3, or the inferior cervical glands 4. From the axillary glands 3, the lymphatics, reduced in number to four or five, run along the subclavian vein *v*, and artery H, and either enter the subclavian vein, or join the lymphatics of the neck, or the thoracic duct 1.

The deep-seated lymphatics accompany the arterial distribution, beginning from the digital branches, and extending to the volar, the ulnar, the interosseal, the radial, the brachial, and the axillary arteries, and terminating in the axillary glands 3. In this course they inosculate frequently with the superficial, and receive the lymphatics 5 from the sternal aspect of the thorax, the mamma and the pectoral muscles. These latter lymphatics are marked 5 in *Fig.* 1 of Plate XI.

The superficial lymphatics from the sternal and lateral aspects of the thorax, originate as high up or atlantad as the sacral, or lower part of the neck, and as low down or sacrad as the umbilicus. The atlantal set runs along the greater pectoral muscle to the axillary glands; the sacral set ascends, and some of them pierce the rectus muscle, and join the lymphatics of the thorax. The lateral set ascends on the external oblique and serratus magnus muscles to the axillary glands, and some of them pierce these and the intercostal muscles, in order to join the intercostal lymphatics.

The lymphatics of the right upper extremity terminate either in the right subclavian vein, or in the internal jugular of the same side, and are frequently joined by the lymphatics of the right side of the head and those of the right lungs, so as to form a right thoracic duct. This, however, is of very short extent, being seldom more than an inch in length.

Besides the lymphatics of the upper extremity and

those of the mamma, joining the axillary glands, there are all the superficial lymphatics of the back, from the nape of the neck to the lumbar vertebræ. Those in the cervical region descend on the trapezius muscle, pierce the deltoid muscle, and join the axillary glands, receiving in their course the lymphatics of the shoulder. The lymphatics situated in the lumbar and dorsal regions ascend on the trapezius muscle, which they pierce to get to the axillary glands.

Besides the glands already described, there are generally from five to eight lymphatic glands (marked with the digits 22, in *Fig.* 1 of Plate XI.) situated in the course of the brachial artery. The lymphatic axillary glands 3 vary from eight to twelve in number, and are much larger than the preceding. They are closely connected by cellular substance with the axillary vein *u* and artery *h*, being plentifully supplied by their branches,* and they extend upwards or proximad beneath the pectoral muscles and clavicle to the inferior cervical glands 4.

The lymphatics of the head and neck are arranged also into superficial and deep-seated sets.

The superficial lymphatics of the head originate on the coronal aspect of the cranium, and accompany the frontal 91, the temporal *g*, and occipital *d* arteries, as delineated in Plate XII. Those marked 23, which accompany the frontal artery 91, with its vein *z*, descend to the inner angle of the orbit, where they accompany the facial artery *c*, with its vein *z*, to the base of the inferior maxillary bone, and unite with those which accompany the temporal artery. In this course they inosculate with the lym-

* As the axillary glands are very subject to inflammation, suppuration, scirrhus, and cancer, particularly when the last disease affects the mamma, the student should make himself thoroughly master of their situation and relative connexion.

phatics 24 of the temporal artery *g*, and are joined by several lymphatic vessels from the integuments of the face; they also run through or communicate with the lymphatic glands, marked 25, situated on the buccinator muscle, and those at the base of the lower jaw bone, marked with the digits 7.

The lymphatics marked 24, accompanying the temporal artery *g*, originate on the coronal aspect of the cranium, where they inosculate with those 23, which accompany the frontal 91, and the occipital *d* arteries, and then descend to the zygoma, where they communicate with some superficial lymphatic glands, marked 8, and afterwards accompany the artery to the angle of the inferior maxillary bone, where they unite with those of the face, the occiput, and nape of the neck, and join the superficial cervical glands, marked 9. From these glands, some of them descend on the external jugular vein *d*, and terminate in the inferior cervical glands, marked 4. Some of these lymphatics run superficially or dermad to the parotid gland s, where they inosculate freely with those of the face. The lymphatics of the occiput, marked 26, originate on the coronal aspect of the cranium, where they inosculate with those, 24, accompanying the temporal artery *g*, and descend behind the ear, in company with the occipital artery *d*, to the insertion of the sterno-cleido-mastoideus muscle E, where they leave the artery, running superficially to this muscle towards the lobe of the ear, where they join some of the superficial lymphatic glands of the neck, marked 10, and inosculate with the temporal lymphatics and those of the nape of the neck; some of them afterwards descend along the sterno-cleido-mastoideus muscle E, to its clavicular origin, where they terminate in the inferior cervical glands, marked 4.

The deep-seated lymphatics of the face derive their

origin from the muscles of the face, the nose, and the mouth, and descend to the deep superior cervical glands,* marked 6 in *Fig.* 1 of Plate XI., where they are joined by the lymphatics of the nares, the mouth, the tongue, the palate, the pharynx, and the larynx. The lymphatics of the nares accompany the internal maxillary artery to these lymphatic glands.† The deep-seated of the cranium, or rather those of the brain, have never been seen, but when this organ was in a diseased state, and effusion on its surface had taken place; in which case lymphatic vessels are seen on the dura mater, arachnoid coat, and pia mater; they accompany the primary divisions of the internal carotid and vertebral arteries (for no lymphatics have been discovered in the substance of the brain), back to their origin out of the cranium, where some of them terminate in the deep superior cervical glands 6, in *Fig.* 1 of Plate XI., or descend to the inferior cervical glands 4, inosculating on their emergence from the cranium with the superficial cranial and facial lymphatics. Some of these lymphatics accompany the internal jugular vein. The united lymphatics, from the surface of the head and its interior, descend along the internal jugular vein M, in *Fig.* 1 of Plate XI., and cellular web, covering the muscles posterior or dorsal to it, receiving in their course the lymphatics from the trachea K, the thyroid gland Z, the œsophagus, and muscles and integuments of the neck, and inosculating freely with each other, downwards to the inferior cervical glands 4, where they emerge in one or more trunks, which termi-

* Syn. Glandulæ jugulares; Glandulæ concatenatæ.

† The relative situation of these glands to the nerves and blood-vessels in this region should be thoroughly understood, as they are frequently the seat of operation, in consequence of becoming scirrhous and cancerous; they are also subject to inflammation, suppuration, and all the species of sarcoma.

nate either in the thoracic duct 1, or in the internal jugular vein M, or in the subclavian vein *v*, but most frequently in the internal jugular vein. In many instances, these lymphatics of the head and neck unite immediately before their termination with those of the upper extremity, and even those from the lungs; on the right side this is almost invariably the case, as described in page 23.* Besides the lymphatic glands already enumerated, some are found behind or centrad of the parotid gland, others along the course of the common carotid artery, and internal jugular vein M, some of the latter of which are marked 11 in *Fig.* 1 of Plate XI.

The lymphatics of the lower extremities are divided into a superficial and deep set, like the rest of the system. The superficial lymphatics, marked with the digits 27, in *Figs.* 1 and 2 of Plate XIII., run between the integuments and the fascia lata K. They begin on the patellar aspect on each side of the toes, accompanying the branches of the saphena major vein, marked *b* in *Fig.* 2, along which they chiefly ascend on the leg to the tibial aspect of the knee joint, where they are joined by another set of lymphatic vessels, which originate from the outside or fibular aspect of the sole of the foot, and accompany the saphena minor vein upwards or proximad to the poples, where, as already observed, they join the preceding, or the deep lymphatics accompanying the popliteal artery. Both of these fasciculi of superficial lymphatic vessels frequently inosculate in their progress. In their course along the patellar aspect of the inner malleolus *s*, the

* The course of the lymphatic vessels to the glands should be understood, to enable us to comprehend how these glands in the neck become affected, when, for example, the disease is in the nose or mouth. The lymphatic glands in the region of the parotid and submaxillary glands are frequently first affected with disease, and afterwards involve these salivary glands.

first series of lymphatics, 27, is joined by some which originate on the sole of the foot. The lymphatic vessels formed by the union of these two fasciculi, ascend on the tibio-patellar aspect of the thigh, as represented in *Fig.* 2 of Plate XIII., where they still chiefly accompany the saphena major vein *b*, upwards or proximad to the inferior superficial lymphatic glands,* marked with the letters *a*. In this course along the thigh, these are joined by several lymphatics of the integuments from the outer or fibular, and the posterior or popliteal aspects; and throughout their whole extent, they frequently unite with the deep-seated.

The deep-seated lymphatics accompany the respective deep arteries of the leg, as the anterior tibial, the posterior tibial, and the fibular, uniting with each other at the poples, where they enter the popliteal lymphatic glands, and also inosculating frequently with the superficial lymphatic vessels. From their emergence at the popliteal glands, there are generally from four to six large trunks, which accompany the popliteal and superficial femoral arteries, upwards or proximad to the groin, where some of them join the inferior superficial inguinal glands, marked *a* in *Fig.* 1 of Plate XIII.; others join the deep-seated inguinal glands, marked 15 in Plate X.; while others again run by the side of these glands, receiving in their course those of the superficial lymphatic vessels which have emerged from the inferior superficial inguinal glands *a*, and enter the abdominal cavity with the crural artery t, T, and its vein U, and terminate in the external iliac glands 16. The other deep lymphatics of the thigh accom-

* It is this lower or distal series of lymphatic glands which becomes affected in the first instance, in wounds and diseases of the leg, distal to them, as, for example, in ulcers.

pany either the obturator artery, the ischiadic artery, or the gluteal artery, and join the sacral and hypogastric lymphatic glands. So also do the lymphatics of the perineum accompany the internal pudic artery, and join the hypogastric glands.

The superficial lymphatic vessels of the abdomen, beneath or sacrad to the umbilicus, marked 28, in the regions of the loins 30, the nates 31, the penis 32, the scrotum 33, and the perineum, inosculate frequently with each other, and ultimately join the superior superficial inguinal lymphatic glands, marked 17* in *Fig.* 1 of Plate XIII. From these superior glands 17, the lymphatic vessels, reduced in number, descend to the inferior inguinal glands *a*. The superficial lymphatic vessels of the inferior half of the abdomen inosculate with those of the superior half, where they originate or commence. The superficial lymphatics of the penis and scrotum often inosculate with the superficial lymphatics of the thigh, as seen in *Fig.* 1 of Plate XIII. Those of the penis, marked 32 in *Fig.* 1 of Plate XIII., are generally three in number, and begin at the prepuce, from which they extend to the root of the member, inosculating with each other, and ultimately separating into two sets, one of which runs to the glands on the one side, and the other set to the series of glands on the opposite side. The lymphatics of the scrotum 33, inosculate with those of the testis b. Those of the clitoris and external labia in the female also inosculate with those of the thigh, and terminate in the superior superficial lymphatic glands.†

* It is these superior inguinal lymphatic glands which become affected with bubo, supervening to gonorrhœa, or syphilitic ulcer, on the glans, prepuce, or scrotum.

† This chain of connexion should be kept in view in syphilitic chancres occurring in the female.

The deep lymphatic vessels of the penis accompany the internal pudic artery to the hypogastric glands. The deep lymphatic vessels of the clitoris take the same course. The lymphatics of the lower portion of the vagina ascend to the external aperture of the inguinal canal, enter the abdominal cavity, and run along the round ligaments to the uterus, where they join the lymphatics of that organ. Besides the lymphatic glands of the lower extremity, already described, there are some others. One or two is occasionally found in the course of the anterior tibial artery, near the knee joint, and is named glandula tibialis antica. The popliteal glands are small, commonly about three in number, and are in close contact with the popliteal blood-vessels.

In the pelvis a number of lymphatic vessels originates from the viscera in this cavity; in the male, from the urinary bladder, the prostate gland, and vesiculæ seminales; and in the female, from the urinary bladder, uterus, and its appendages. In the male, those of the bladder, prostate gland, and vesiculæ seminales, inosculate with each other, and ascend to enter the external iliac 16, the hypogastric, or internal iliac 19, and sacral lymphatic glands. In the female, those of the bladder take the same course. Those of the vagina, and os et cervix uteri, accompany the uterine arteries to the hypogastric glands; those of the body and fundus of the uterus accompany the spermatic arteries, being joined in their course by the lymphatics of the ovaria, and enter the lumbar glands. The lymphatics of the ureters partly join those of the urinary bladder, and partly ascend along the ureters, to enter the lumbar glands, inosculating with the lymphatics of the kidneys. Independently of these in the cavity of the pelvis, there are several lymphatic vessels around its parietes; thus, some originate from the central aspect of the sym-

physis pubis, where they are joined by lymphatics of the pyramidalis and levator ani muscles, and proceed to join the external and internal iliac glands; while others derive their origin from the concave aspect of the sacrum and coccyx, from the sacro-ischiadic plexus of nerves, where they are joined by those which accompanied the gluteal, ischiadic, and internal pudic arteries from without the pelvis, and terminate in the hypogastric glands.

The lymphatics of the testicle, marked 34 in Plate X., are exceedingly numerous, and consist of a superficial and deep set, the former deriving its origin from the tunica vaginalis, and the latter from the substance of the gland r, *r*. From this they ascend in company with the spermatic artery *g* to the inguinal canal, enter the abdominal cavity, and extend along the artery to the lumbar glands, where they inosculate with the renal lymphatics. At their origin they are joined by some of the lymphatics of the scrotum.

The external iliac glands, about eight or ten in number, extend along the course of the artery of the same name; and the internal iliac or hypogastric glands, about twelve in number, also extend along their artery. The sacral glands, small and numerous, extend between the hypogastric glands of each side, being situated between the rectum and the sacrum, and mingling with the mesocolic glands. The lumbar glands, extremely numerous and large, are situated around the vena cava ascendens, and abdominal aorta, from its bifurcation into the two common iliacs upwards or atlantad to the renal arteries, on the latter of which they extend laterad, and also on the sides of the bodies, and transverse processes of the lumbar vertebræ.

The lymphatics of the kidneys consist of a superficial and deep set, the former run over the surface, inosculat-

ing with the lymphatics of the supra-renal glands, onwards or mesiad to the concave fissure of the kidney, where they join the deep-seated lymphatics which come from the substance of the gland. From the concave fissure both of these lymphatics accompany the renal arteries, inosculating with those of the ureters and spermatic cord, and terminate either in the lumbar glands, or the thoracic duct itself.

The lymphatics of the supra-renal glands join either those of the kidney, or the liver, or the spleen, according to the side of the body to which they belong.

The lymphatics of the peritoneum and muscles, forming the parietes of the abdomen, accompany those arteries which are in their vicinity; thus, for example, those on the sternal aspect accompany the epigastric artery to its origin, and terminate in the external iliac glands. Those on the lateral aspect, accompany the lumbar and the circumflex iliac arteries, the former joining the lumbar glands, where they generally run across to the lymphatics of the opposite side, to form the lumbar plexus. Those which accompany the circumflex iliac artery terminate in the external iliac glands.

The lymphatic vessels which have been described entering the lumbar glands, emerge from these in one or two trunks; that on the right side emerges and ascends dextrad of the aorta, to the right renal artery, a little atlantad to which it unites with that of the left side, which crosses from left to right, behind or sacrad to the aorta, and here both are joined by the concentrated lymphatic vessel from the intestines, which descends dextrad of the origin of the superior mesenteric artery and the aorta, to form the thoracic duct described in page 18.

Sr. Lippi of Florence has traced some lymphatic vessels from the lumbar glands, entering the vena cava as-

cendens, near the third lumbar vertebra. He has also discovered other lymphatics at once entering the venous system, as, for example, the lymphatics of the liver joining the vena portæ. In one of his experiments, having inserted a pipe in one of the left external iliac lymphatic vessels, and injected mercury, he perceived in the left lumbar region several lymphatic vessels enter the vena cava ascendens, some running sternad, others dorsad, of the aorta; also some ascending and joining the superior mesenteric and splenic veins. In another experiment, he found some lymphatic vessels at once enter the common iliac vein.

The structure of a lymphatic vessel is somewhat similar to that of a vein; only it has no distinctly visible muscular fibres, even in the largest trunk, the thoracic duct. It is presumptive, however, that it possesses either these fibres or others analogous, as it evidences sensibility and motion in its living action. The external tunic is partly fibrous.* The parietes of a lymphatic vessel are exceedingly thin, and consist of a distinct fibro-cellular and a serous tunic, both of which are very extensible, and the external possesses considerable strength. Throughout the system of lymphatic vessels, a number of valves are situated, which are reflections of the internal serous tunic, and are much less numerous in the thoracic duct than in the smaller branches. These valves are of a semilunar or parabolic figure, the convexity towards their origin, their concavity towards the venous system; they are generally arranged two and two, the one being a little larger than the other; sometimes there is only one, while at others there are three; the latter,

* Sœmmerring and Schreger have seen transverse muscular fibres in the thoracic duct of man and the calf.

however, is very rarely the case. The lymphatics have minute nerves, and vasa vasorum distributed on them.*

The lymphatic glands, which we have seen to be in general small, hard, roundish, and in some degree flattened bodies, are of the conglobate class, and of a reddish-grey colour. Their size and colour vary in different parts of the body; they are smallest on the serous membranes, and largest in the axillæ, at the root of the lungs, mesentery, pelvis, and groins; but the largest and smallest are found together in these regions. The smallest are clear, as those on the pleura and peritoneum; the subcutaneous are of the reddish-grey colour, while those at the root of the lungs and trachea are almost black. They also vary in size at the different periods of life; they are larger in early than in advanced age, and greater in size in the female than in the male.

They are enveloped in a condensed cellular tissue, and free from the contiguous structures; they seem on first aspect to be homogeneous, but when they are filled with air or mercury, they become knotted on their external surface; and in their interior, the lymphatic vessels which enter them, divide into a multitude of very delicate ramifications, accompanied with equally delicate arteries, veins, and nerves, the latter consisting of excessive tenuity, all connected together by a delicate cellular tissue. The arteries are extremely numerous. The lymphatic vessels which enter the lymphatic glands, are more numerous than those which emerge to proceed onwards to the thoracic duct. In the fetus no lymphatic glands exist, and there are in their stead merely simple plates, where the continuity of lymphatic vessels is quite apparent.

* The lymphatic vessels are exceedingly subject to inflammation and suppuration.

INDEX

OF

THE LETTERS OF REFERENCE

IN

PART XII.

GRAVID UTERUS, AND LYMPHATICS.

PLATE VII.

A, Mons veneris
E, Cervix uteri
K, Body of uterus
L, Ileum
M, Caput cœcum coli
N, Ovarium
O, Ascending portion of colon
P, Transverse arch of colon
S, Corpus fimbriatum
h, Omentum majus
k, Fundus uteri

a, Peritoneum, investing flaps of abdominal parietes
*k**, Fallopian tube
*k***, Ovarian aperture of Fallopian tube
z, Sigmoid flexure of colon

PLATE VIII.

A, Mons veneris
E, Cervix uteri
K, Body of uterus
L, Ileum

PLATE VIII. *(Continued.)*

M, Caput cœcum coli
N, Ovarium
O, Ascending portion of colon
P, Transverse portion of colon
S, Corpus fimbriatum

g, Umbilical vein
h, Omentum majus

a, Peritoneum investing flaps of abdominal parietes

b, Section of uterus
c, Amnion
d, Chorion
f, Decidua
*k**, Fallopian tube
*k***, Ovarian aperture of Fallopian tube
n, Umbilical artery
p, Placenta
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PLATE IX. *Fig.* 1.

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c, Amnion

d, Chorion
f, Decidua
p, Placenta

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c, Amnion

d, Chorion.

Fig. 3.—An Ovum, 40 days old.

d, Chorion.

Fig. 4.—An Ovum, 40 days old, laid open.

c, Amnion
d, Chorion

e, Fetus
h, Vesicula umbilicalis

Fig. 5.—A Fetus, 50 days old.

h, Vesicula umbilicalis.

Fig. 6.—A Fetus, 60 days old.

u, Umbilical cord.

Fig. 7.—An Ovum, 60 days old.

d, Chorion.

Fig. 8.—An Ovum, 60 days old.

d, Chorion.

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g, Umbilical vein
c, Amnion
d, Chorion
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PLATE X.

A, Ribs
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H, Left subclavian artery
I, Right lobe of liver
I*, Rectum
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L, Ileum
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O, Ascending portion of colon
P, Transverse arch of colon
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R, Superior mesenteric artery
T, External iliac artery
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P, Left carotid artery

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r, Cephalic vein
s, Parotid gland
s*, Median vein
u, Brachial vein

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h, Vena cava descendens
u, Axillary vein
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11, Lymphatic glands accompanying the internal jugular vein
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v, Fascia palmaris

q, Basilic vein
r, Cephalic vein

s, Median vein

2, Lymphatic glands at elbow joint

PLATE XII.

A, Clavicle
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D, External jugular vein
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PLATE XIII. *Fig. 1.*

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Z, Scrotum

b, Tunica vaginalis testis

PLATE XIII. *Fig.* 1. *(Continued.)*

a, Inferior superficial inguinal glands

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17, Superior superficial inguinal glands

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32, Superficial lymphatics of the penis

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Fig. 2.

K, Fascia lata

b, Vena saphena major

s, Malleolus internus

27, Superficial lymphatics of the leg